



Copernicus

General Overview

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European Commission – Space Data for Societal Challenges & Growth
Copernicus Training and Information Session in Vienna, 14 November 2018



Copernicus

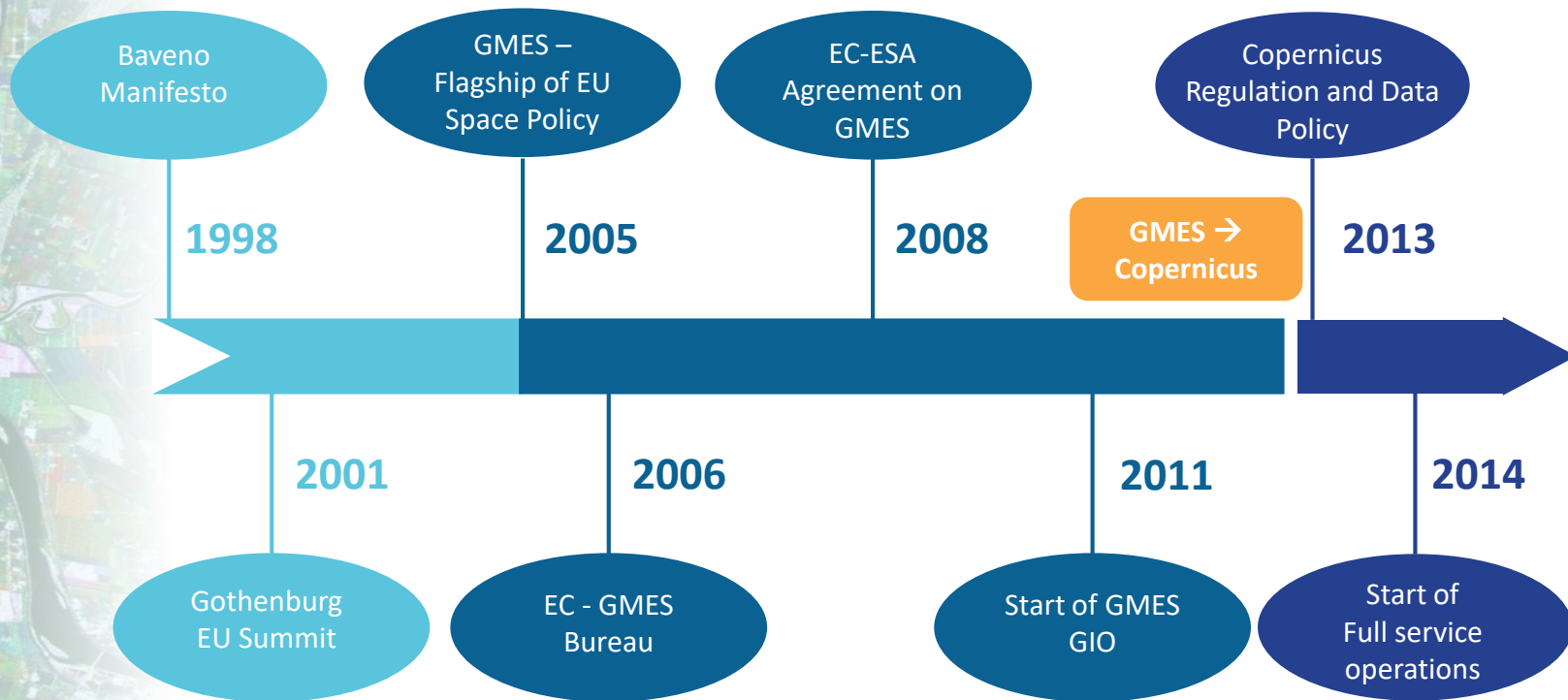
C O P E R N I C U S I N B R I E F

- **Copernicus is the flagship EO 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**
- Based on **User Requirements**
- **Full, free and open data policy**
- Is a tool for **economic development** and a driver for the **digital economy**



Copernicus

COPERNICUS HISTORY

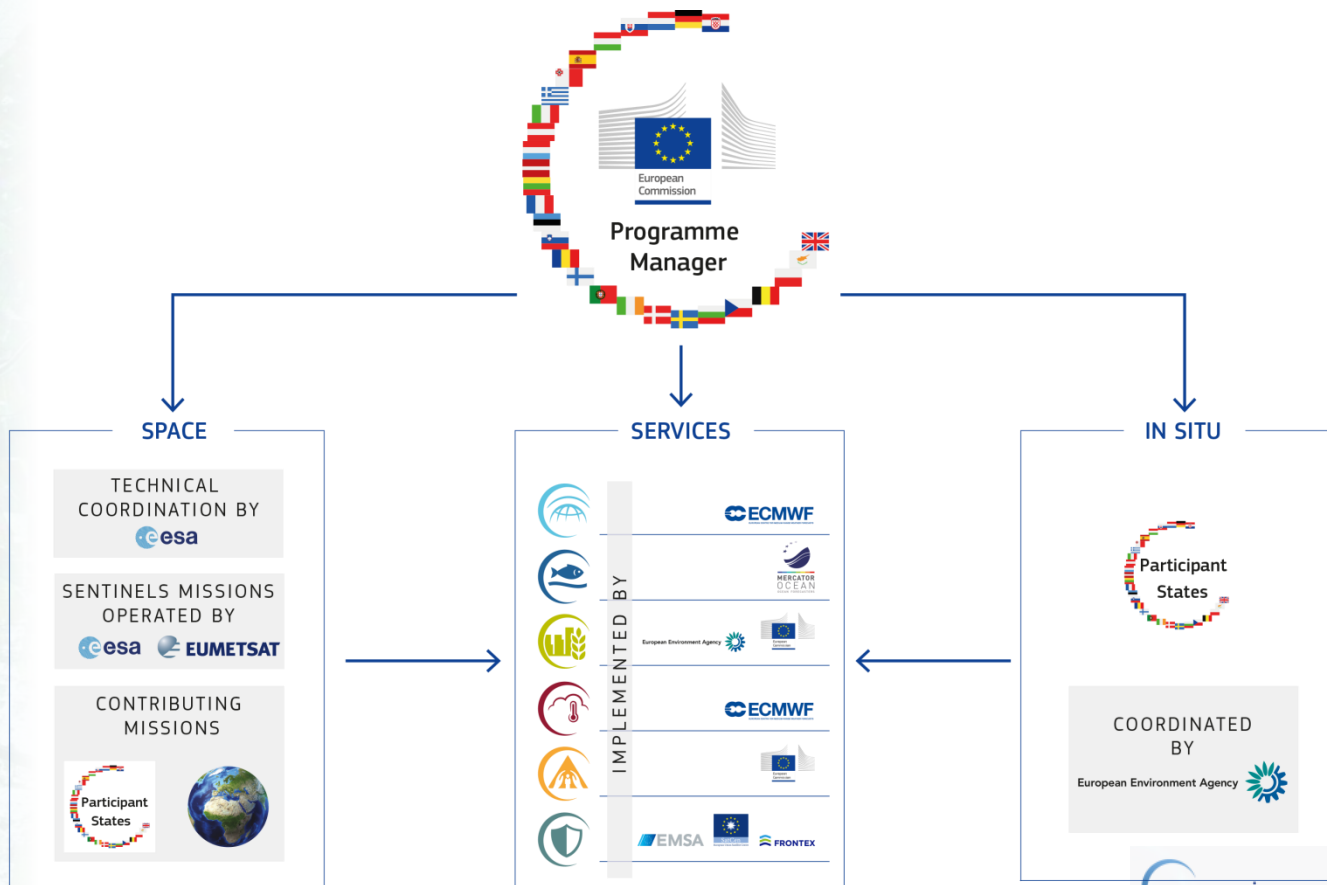


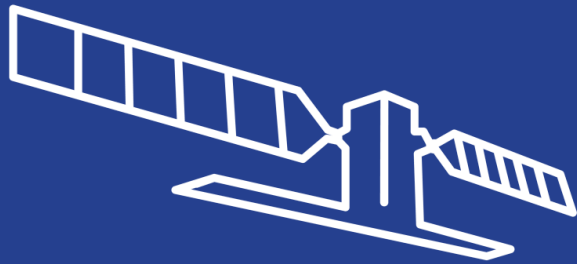
GIO = GMES Initial Operation



Copernicus

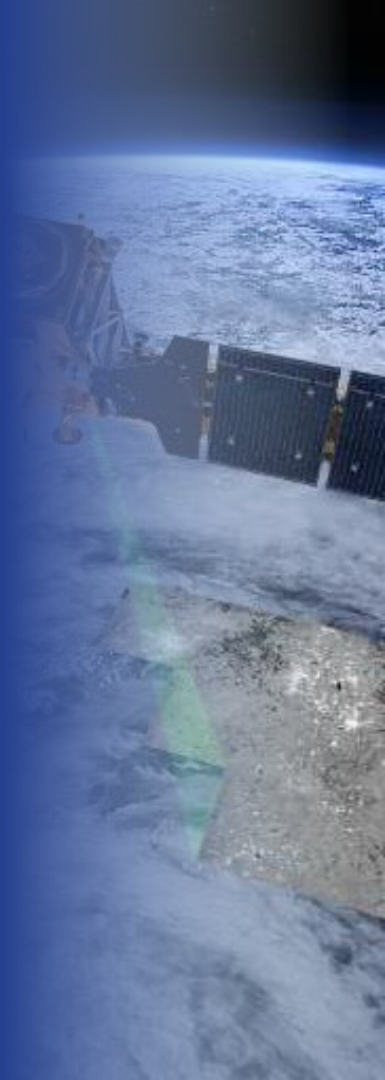
COPERNICUS GOVERNANCE





Space Component








Copernicus Space Component



THE SENTINELS

Full, free and open access

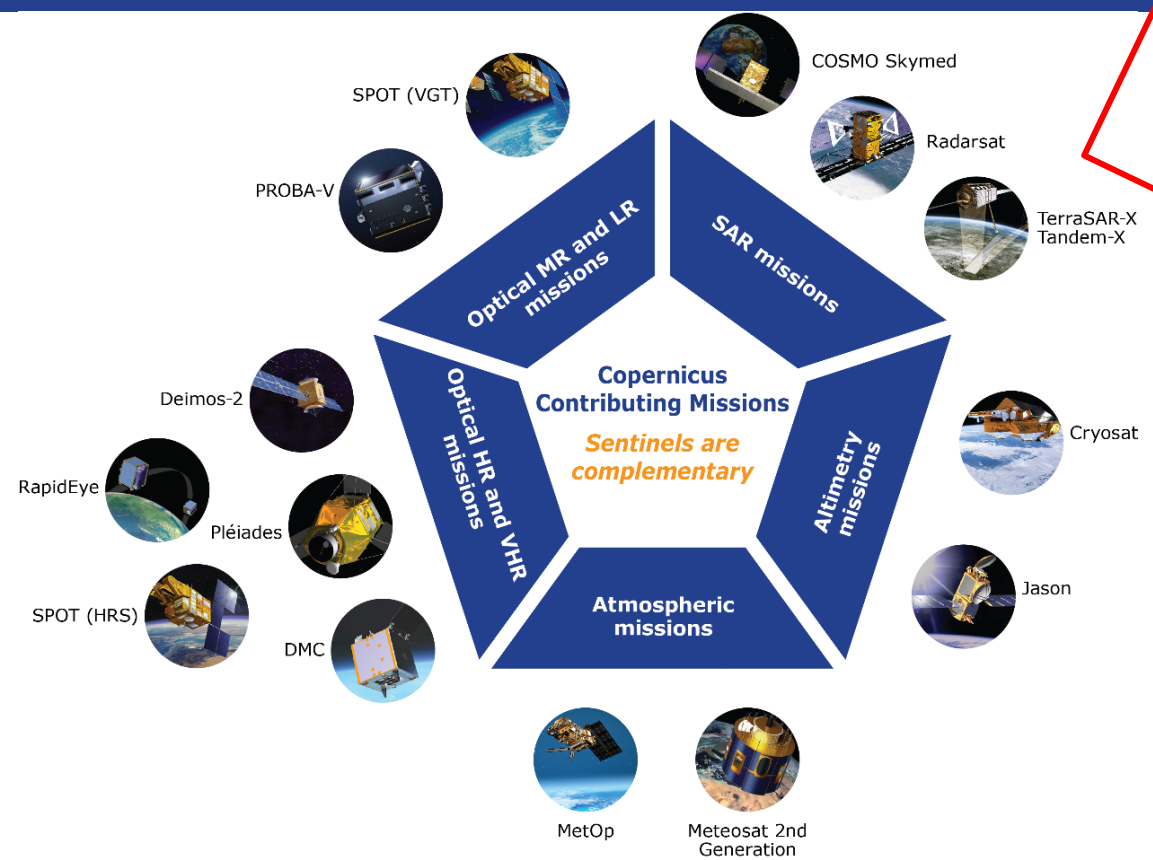
Key Features

	SENTINEL-1: 4-40m resolution, 3 day revisit at equator	S1A and 1B in orbit	▶ Polar-orbiting, all-weather, day-and-night radar imaging
	SENTINEL-2: 10-60m resolution, 5 days revisit time	S2A and 2B in orbit	▶ Polar-orbiting, multispectral optical, high-resolution imaging
	SENTINEL-3: 300-1200m resolution, <2 days revisit	S3A and S3B in orbit	▶ Optical and altimeter mission monitoring sea and land parameters
	SENTINEL-4: 8km resolution, 60 min revisit time	<i>1st Launch 2020</i>	▶ Payload for atmosphere chemistry monitoring on MTG-S
	SENTINEL-5p: 7-68km resolution, 1 day revisit	S5P in orbit	▶ Mission to reduce data gaps between Envisat, and Sentinel 5
	SENTINEL-5: 7.5-50km resolution, 1 day revisit	<i>1st Launch 2021</i>	▶ Payload for atmosphere chemistry monitoring on MetOp 2 nd Gen
	SENTINEL-6: 10 day revisit time	<i>1st Launch 2020</i>	▶ Radar altimeter to measure sea-surface height globally



Space
Component

THE CONTRIBUTING MISSIONS



Subject to Data
Owner's Data
Policy



In situ

Copernicus In situ Component





In situ

IN-SITU: OVERVIEW

- *In situ* data = observation **data from ground-, sea-, or air-borne sensors**, licensed for use in Copernicus
- Used to:
 - **Validate & calibrate** Copernicus products
 - Provide **reliable information** services
- Implementation on two levels:
 1. Tailored *in situ* data **for each Copernicus service**
 2. Cross-cutting **coordination across services** by the EEA





Copernicus

COPERNICUS SERVICES

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



*... Six cross-cutting
Thematic Services*



Land
Monitoring

Benefit areas and products examples

Ecosystems

Biodiversity

Agriculture

Forestry

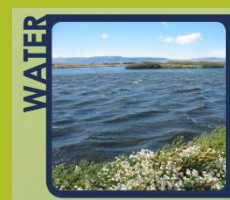
Energy

Natural Resources

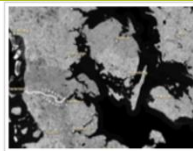
Water

Urban planning

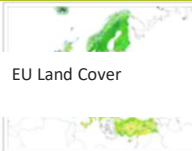
Global



Pan-European



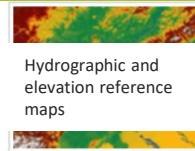
[Image Mosaics](#)



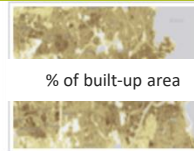
[CORINE Land Cover](#)



[High Resolution Layers](#)



[Reference Data](#)

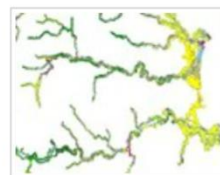


[Related Pan-European products](#)

Local



[Urban Atlas](#)



[Riparian Zones](#)



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



Marine
Monitoring

Benefit areas and products examples

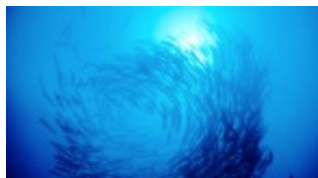
Marine safety

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)



Atmosphere
Monitoring

Benefit areas and products examples

Health

Environment

Pollution

Climate

Renewable Energy

Air Quality and Atmospheric Composition



Climate forcing



Ozone layer & UV



Solar radiation



Emissions and surface fluxes





Climate
Change

Benefit areas and products examples

Climate change

**Mitigation and
adaptation**

Weather forecast

Pollution

Environment

Health

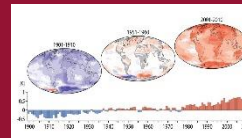
**Consistent Estimates of the
Essential Climate Variables (ECVs)**



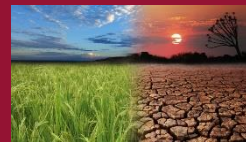
**Support to Mitigation and
Adaptation Strategies**



**Global and Regional
Reanalyses**



**Seasonal Forecasts
And Climate Projections**





Benefit areas and products examples

**Disaster
Emergency
Situations**

**Humanitarian
Crises**



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

...▶ **Socio-economic benefits of Copernicus**





Copernicus

COPERNICUS ECONOMIC BENEFITS

- Poised to generate significant **socio-economic benefits**
- Driver for **research, innovation** and the creation of **highly skilled jobs**

Key Figures



Cost per
EU citizen =
~€1.07/year



Every **€1** spent
generates
a return of
~€3.2



Min. financial
benefits on
EU GDP =
~€30bn by 2030



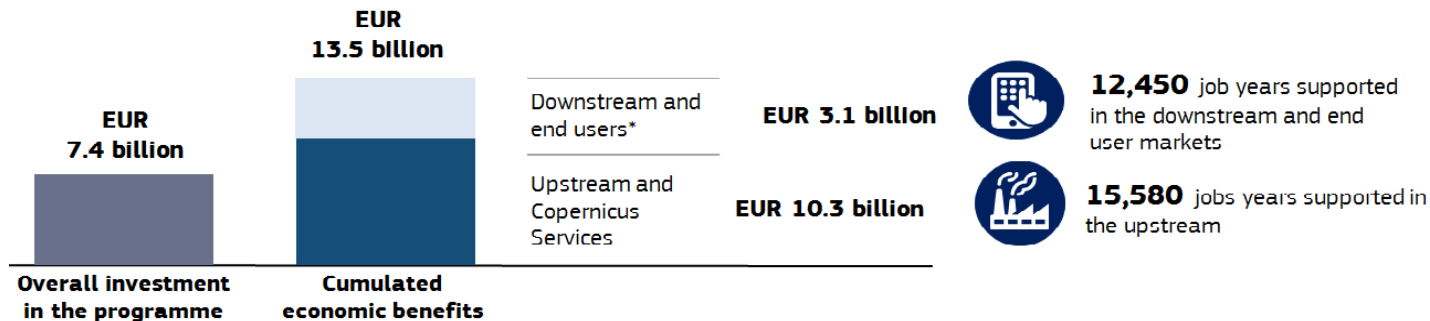
~50.000 jobs
maintained/
created in the
next 15 years



Copernicus

COPERNICUS ECONOMIC BENEFITS

Estimated direct monetary benefits between 2008 and 2020



Examples of existing Copernicus benefits

70% Cost reduction of a precision farming service in Austria, thanks to Copernicus



€ 60k Yearly savings for each construction company using a work progress monitoring app



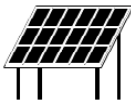
60% Higher accuracy for analysis of the impact of trans-boundaries pollutants on air quality



5% Productivity gain for fish farmers, by monitoring toxic algal blooms



50% Copernicus-based forecasts generate 50% more benefits to solar energy producers than traditional forecasts



€ 186M Benefits of Copernicus on the insurance market in 2015

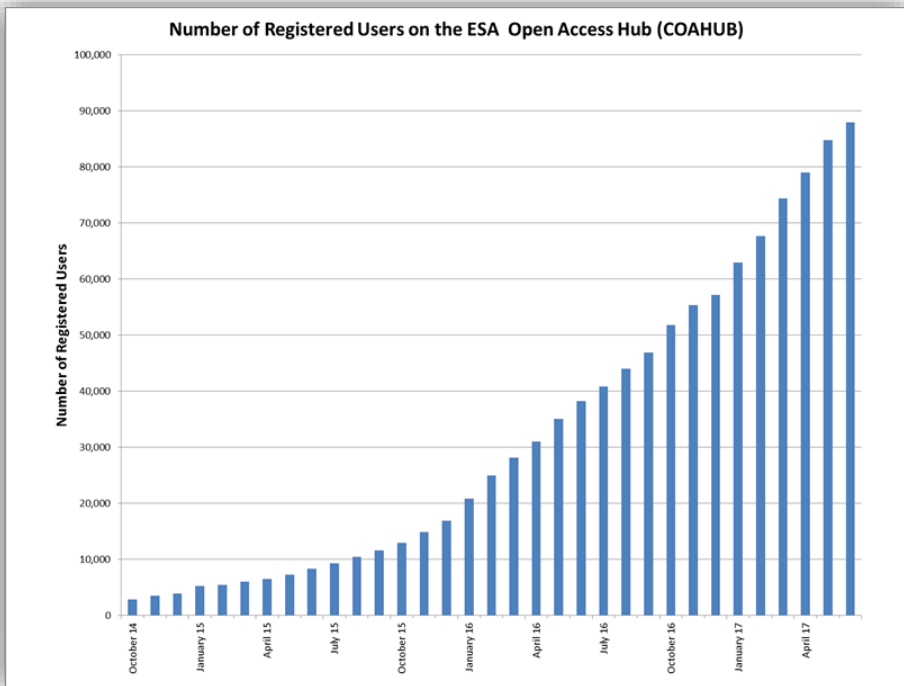


* The Downstream and end user analysis includes only 8 value chains: Agriculture, Forestry, Urban Monitoring, Insurance, Ocean Monitoring, Oil & Gas, Renewable Energies and Air Quality. Estimates for end users were only calculated for Insurance, Oil&Gas and Urban Monitoring. The estimates of downstream and end user benefits should be seen as extremely conservative because they were calculated a year after the launch of the first Sentinel satellite. Benefits are likely to increase significantly as more Sentinels become operational.



User Uptake

The uptake of Copernicus is very strong



➔ Unprecedented growth in number of Sentinel users

➔ Similar trend in the Copernicus services



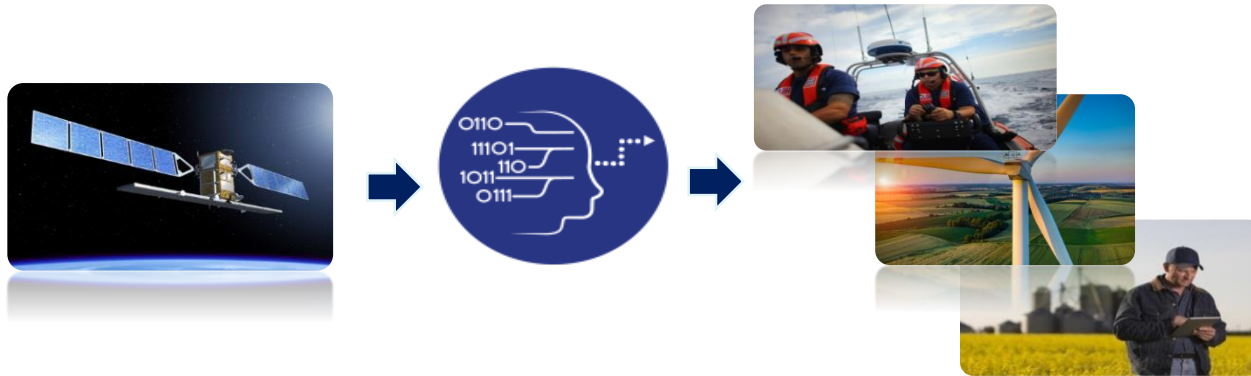
User
Uptake

The Commission strategy

Objective: maximizing the socio-economic benefits of Copernicus;

Challenge: geospatial data (including Copernicus) are difficult to use by non-experts;

Strategy: supporting the emerging downstream eco-system, which use Copernicus data and services to create products for non-experts.





User
Uptake

The Commission Strategy

I) Increase **awareness** about Copernicus

II) Facilitate **access** to Copernicus

III) Support **downstream** actors (public authorities, businesses and researchers)

Leverage with
actions from
Member States and
Entrusted Entities



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Uptake

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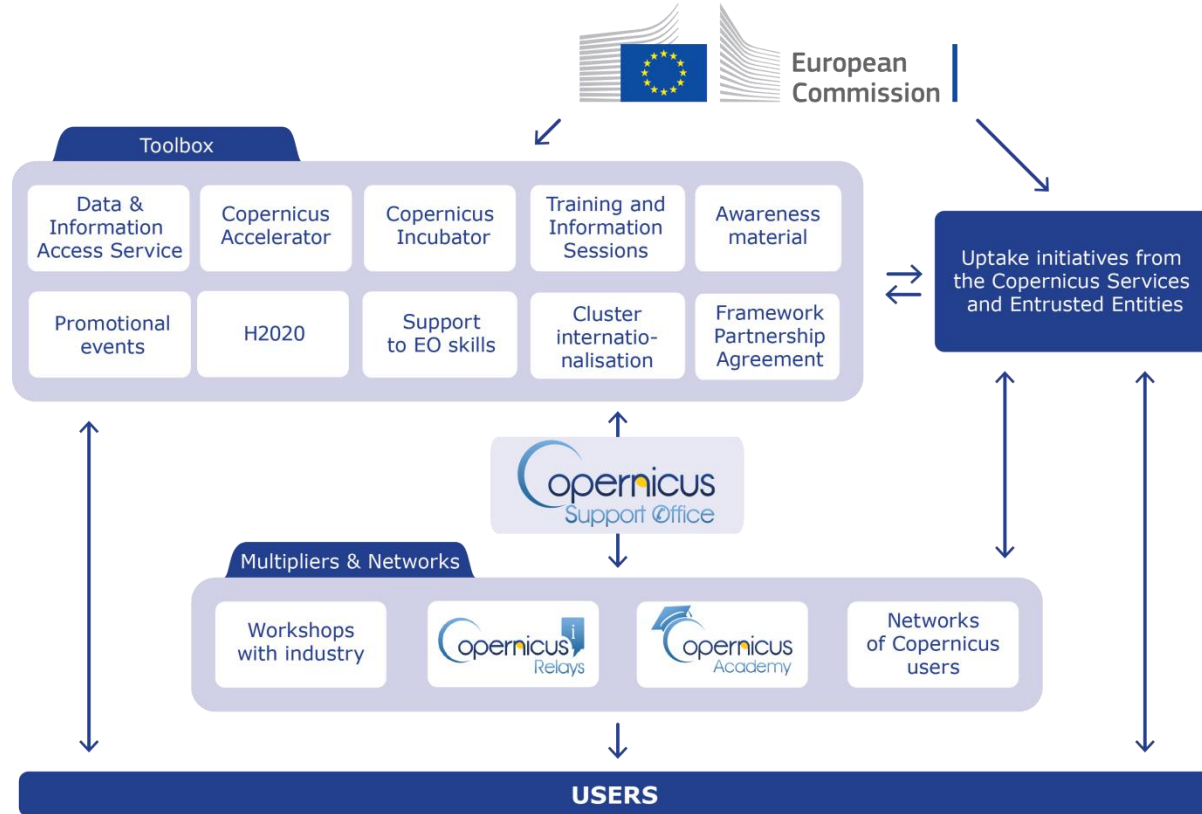
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User Uptake

Copernicus User Uptake Initiatives



Copernicus Networks

Copernicus Relays

80 Relays
33 countries
4 continents

- Reach end-users in different countries and regions worldwide
- Foster local and global cooperation
- Support local users
- Organise promotional events and training

Copernicus Academy

138 Academy members
36 countries
4 continents

- Reach academic institutions worldwide
- Enable global EO research network
- Promote space in education
- Accelerate research to market link
- Build skills



Copernicus Support Office

- 3500+ tickets handled
- replies within 1 or 2 days
- animates Relays and Academy



support@copernicus.eu



Ask on Twitter
[@CopernicusEU](https://twitter.com/CopernicusEU)

AUSTRIAN ACADEMY

- BOKU University of Natural Resources and Life Sciences
- Department of Geoinformatics Z_GIS, University of Salzburg
- Geological Survey of Austria
- Institute for Interdisciplinary Mountain Research
- Space Generation Advisory Council (SGAC) in Support of the United Nations Programme on Space Applications

AUSTRIAN RELAYS

- Austrian Research Promotion Agency



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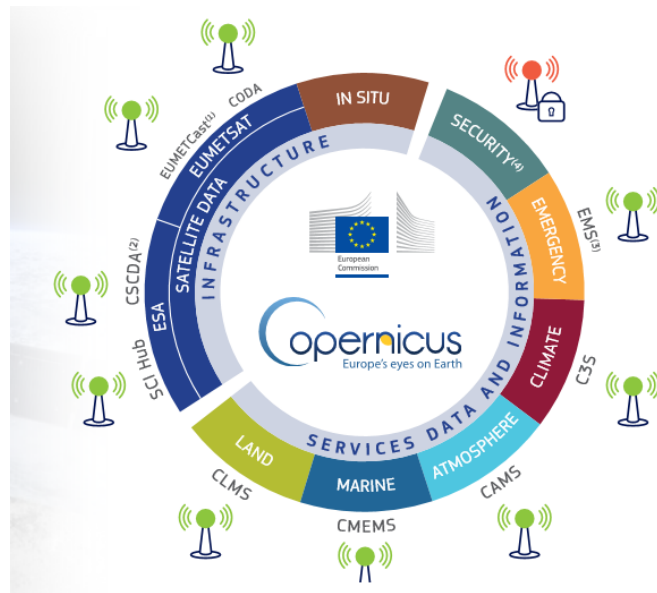


Data
Access

Copernicus Data Access Overview

- **Satellite Data distribution Hubs**
 - Sentinels
 - Contributing missions
 - Access to images in NearRealTime
 - 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.





Data
Access

Copernicus Big Data Approach

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
by COSMOS

WWW.WEKEO.EU



User
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Support downstream actors

As explained in the Space Strategy, *"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."*



Strategy: supporting the eco-system of service suppliers that transform Copernicus data and services into the products required by end users

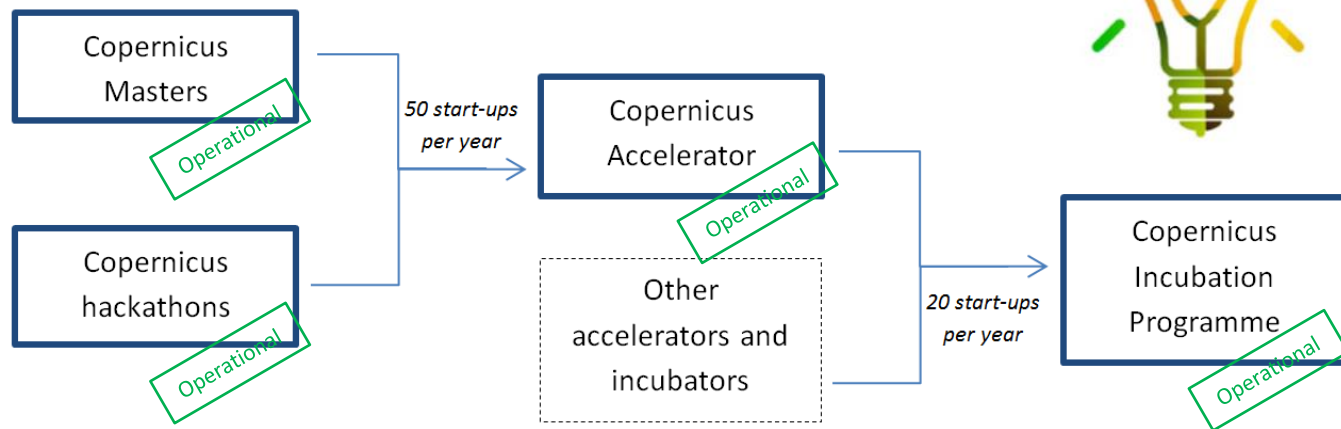


User
Uptake

Pillar 3: Support to downstream actors

Data flow guaranteed at least **up to 2030**, with full, free and open data policy

Copernicus start-up programme





User
Uptake

Pillar 3: Copernicus Masters and Prizes

- A competition for **start-ups** developing applications based on Copernicus
- **10 prizes** offered by industry and public bodies
- **6 prizes** offered by the European Commission (“challenges”):
 - 5000 € cash prize,
 - 5000 € voucher for access to one of the DIAS participation at the Accelerator Programme
- Award ceremony: **December – Marseille** at the Space Week
- Application to the 2019 Masters/Prizes will be in **Spring 2019**.





User Uptake

Pillar 3: Copernicus Hackathons

- A hackathon is a **sprint-like event** in which programmers and subject-experts collaborate to develop software based on Copernicus
- **Organisations** (clusters, companies, universities...) **can apply throughout the year**
- Every year, **the European Commission finances 85%** of the costs of 20 Hackathons, up to EUR 20,000
- 2nd application phase is **open until 31 December 2018**





User Uptake

Pillar 3: Copernicus Accelerator

- The Copernicus accelerator is a one-year **coaching programme** and has **supported 100 start-ups** so far
- Each start-up receives a **mentor** for the duration of the programme, as well as **monthly business online courses**
- The accelerator starts and closes with a BootCamp, where all costs are covered by the EU. Next one will be in Marseille
- **Access to the Accelerator:**
 - Winning a Copernicus Master/Prize
 - Winning a Copernicus Hackathon
 - Selection through an open call





User
Uptake

Pillar 3: Copernicus Incubation

- The European Commission finances the **incubation of 20 start-ups per year**;
- Each start-up receives 50K voucher to spend on **business development**;
- The call for start-ups is **permanently open** (with evaluation every quarter).
- Start-ups must apply jointly the incubator/accelerator of their choice (based in Europe).





User
Uptake

Pillar 3: Copernicus Skills Programme

- **H2020:** forthcoming space calls in support of Copernicus user uptake
- **Ongoing ERASMUS+ sectoral skill alliance for Earth Observation** (with several Copernicus Relays)
- **Forthcoming Copernicus awareness campaign in universities** (in partnership with COSME)

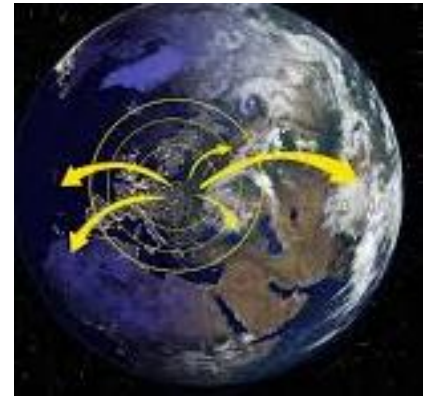


User
Uptake

Copernicus International Strategy

Objectives:

- Maximise the efficiency of EU investments through **cooperation with international partners**
- Promote the uptake of Copernicus data globally integrating **data from international partners** into Copernicus
- Promote access to **international markets for European companies**
- Agreements signed with USA, Australia, India, Brazil, Chile, Colombia
- Discussions ongoing with **ASEAN Countries** and **Singapore**





Copernicus

Copernicus Evolution

- **Stability of the programme and long-term commitment**
 - (Enhanced) **continuity of current data** and services
 - Continuity of **full, open and free data policy** for the environmental domain
- **Additional services will be considered to meet emerging needs** (non-inclusive list):
 - Monitoring CO2 to estimate anthropogenic emissions (priority)
 - Climate change and sustainable development
 - Changes in the Arctic
- **Next generation of satellites:** evaluation on-going to define observation needs in cooperation with users (non-inclusive list):
 - HR thermal infrared observations
 - Hyperspectral measurements
 - SAR L-band observations

This is not to be considered as a commitment of the Commission



Thank you

*Any questions? email me:
martina.sindelar@ec.europa.eu*