



# Copernicus

## General Overview

**Stefano La Terra Bella**

**European Commission – Space Data for Societal Challenges & Growth**  
*Copernicus Training and Information Session in Oslo, 30-31 October 2018*



Copernicus

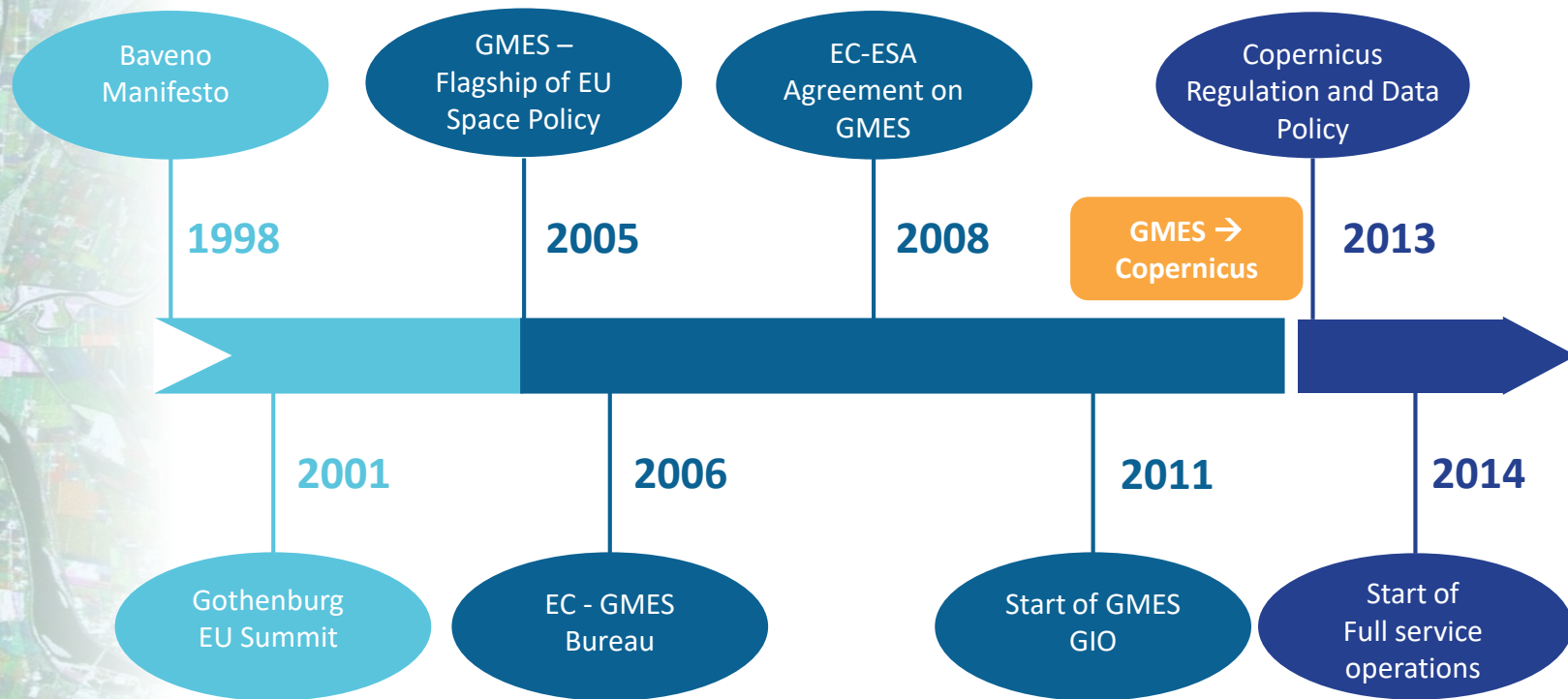
# C O P E R N I C U S   I N   B R I E F

- **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

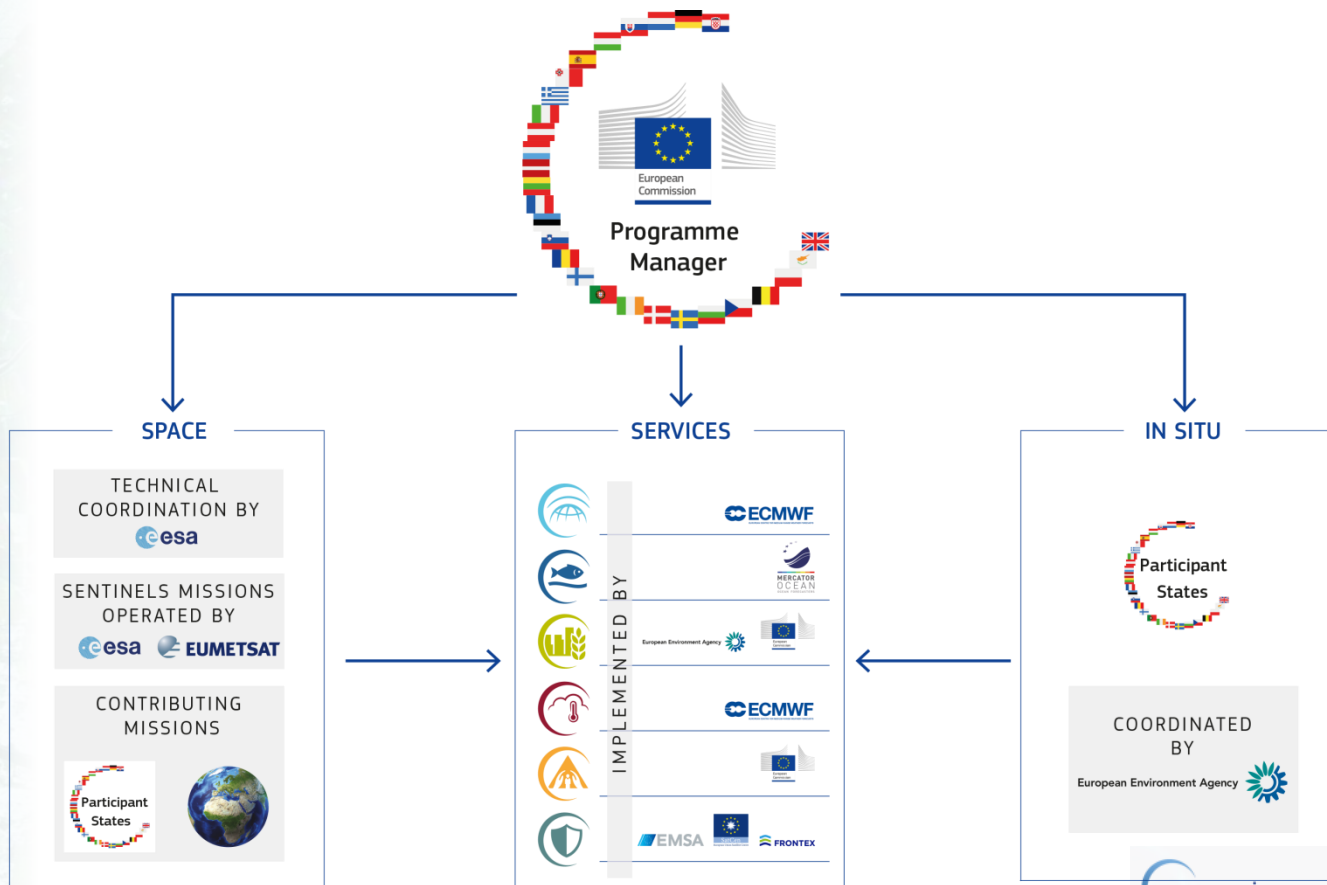


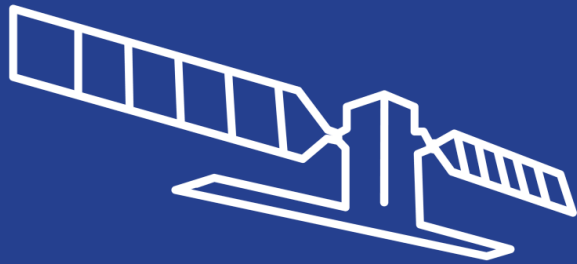
*GIO = GMES Initial Operation*



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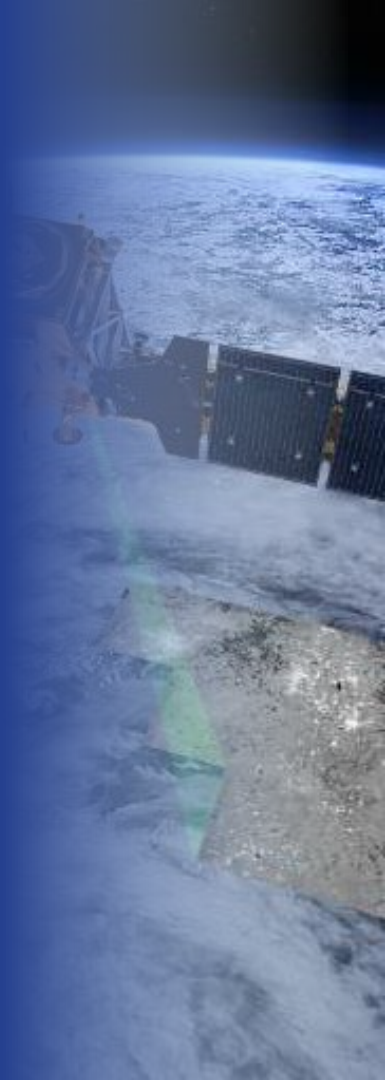
# COPERNICUS GOVERNANCE





Space Component

## Copernicus Space Component












# THE SENTINELS

Full, free and open access

## Key Features

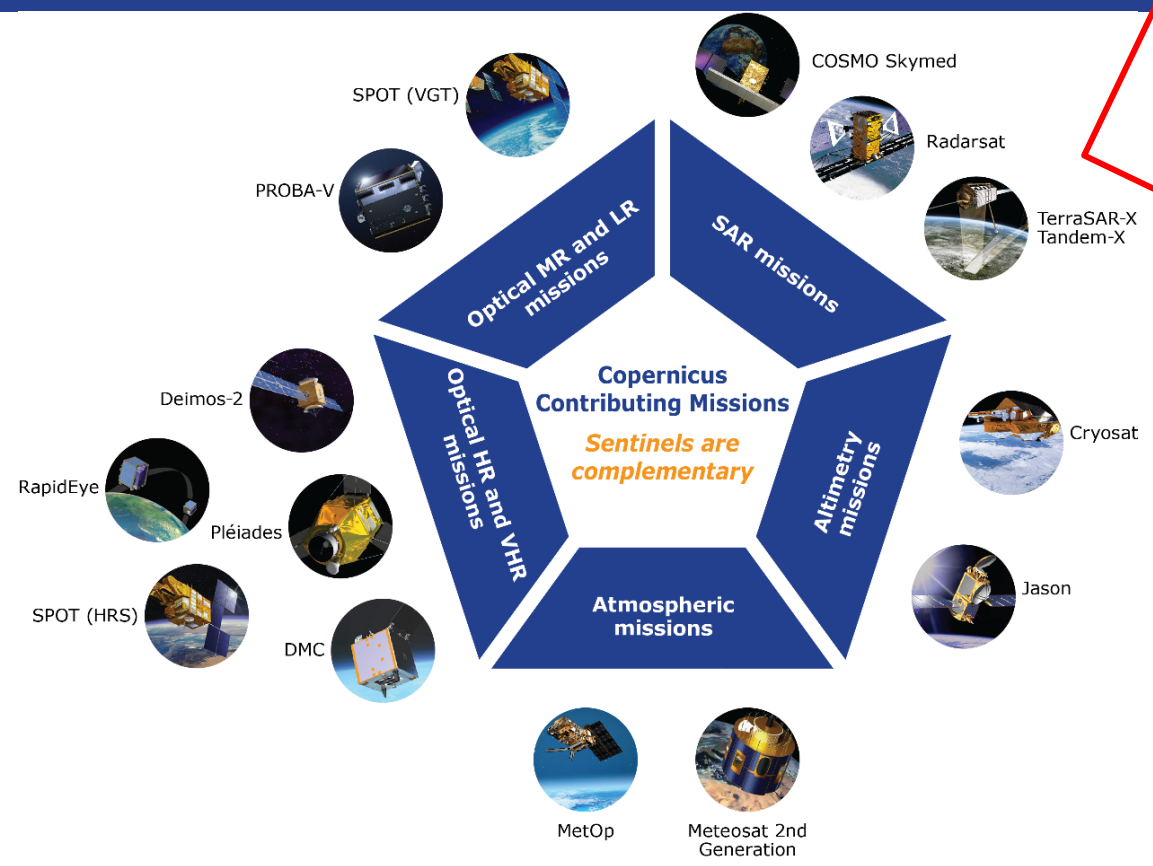
Space Component

	SENTINEL-1: 4-40m resolution, 3 day revisit at equator	<i>S1A and 1B in orbit</i>	▶ Polar-orbiting, all-weather, day-and-night radar imaging
	SENTINEL-2: 10-60m resolution, 5 days revisit time	<i>S2A and 2B in orbit</i>	▶ Polar-orbiting, multispectral optical, high-resolution imaging
	SENTINEL-3: 300-1200m resolution, <2 days revisit	<i>S3A and S3B in orbit</i>	▶ 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	<i>S5P in orbit</i>	▶ 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 <sup>nd</sup> 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





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# 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

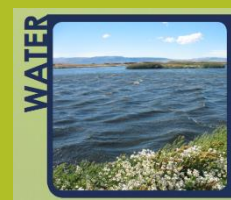
Energy

Natural Resources

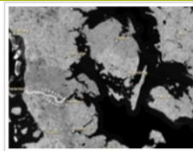
Water

Urban planning

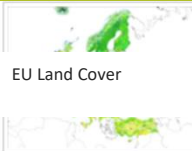
## Global



## Pan-European



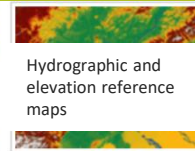
[Image Mosaics](#)



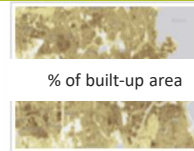
[CORINE Land Cover](#)



[High Resolution Layers](#)



[Reference Data](#)

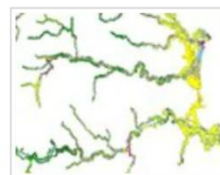


[Related Pan-European products](#)

## Local



[Urban Atlas](#)



[Riparian Zones](#)



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



Marine  
Monitoring

# Benefit areas and products examples

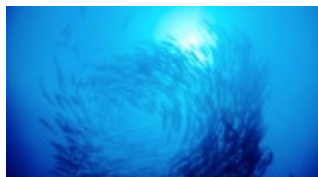
**Marine safety**

**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

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**

**Mitigation and  
adaptation**

**Weather forecast**

**Pollution**

**Environment**

**Health**

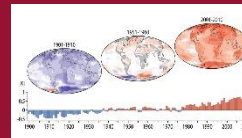
**Consistent Estimates of the  
Essential Climate Variables (ECVs)**



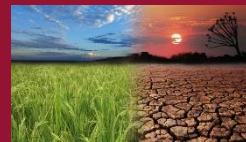
**Support to Mitigation and  
Adaptation Strategies**



**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**





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# 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

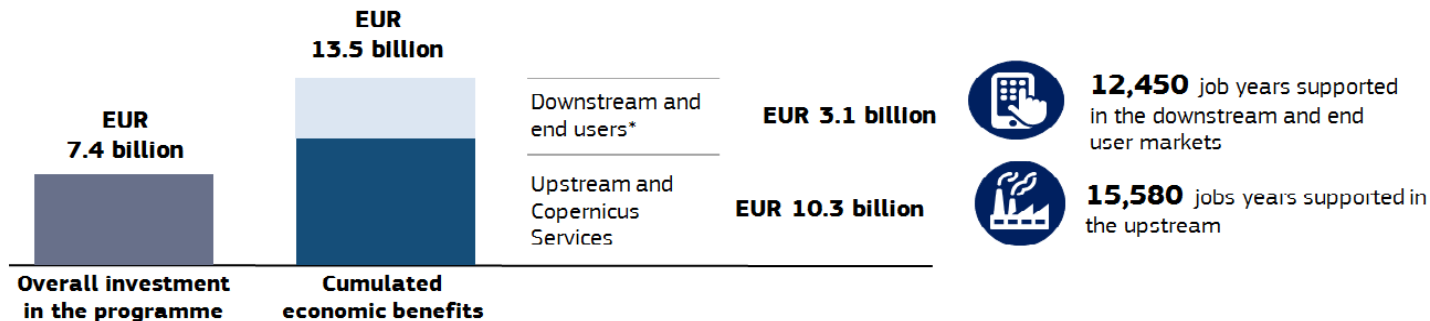




Copernicus

# 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



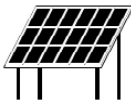
**60%** Higher accuracy for analysis of the impact of trans-boundaries pollutants on air quality



**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

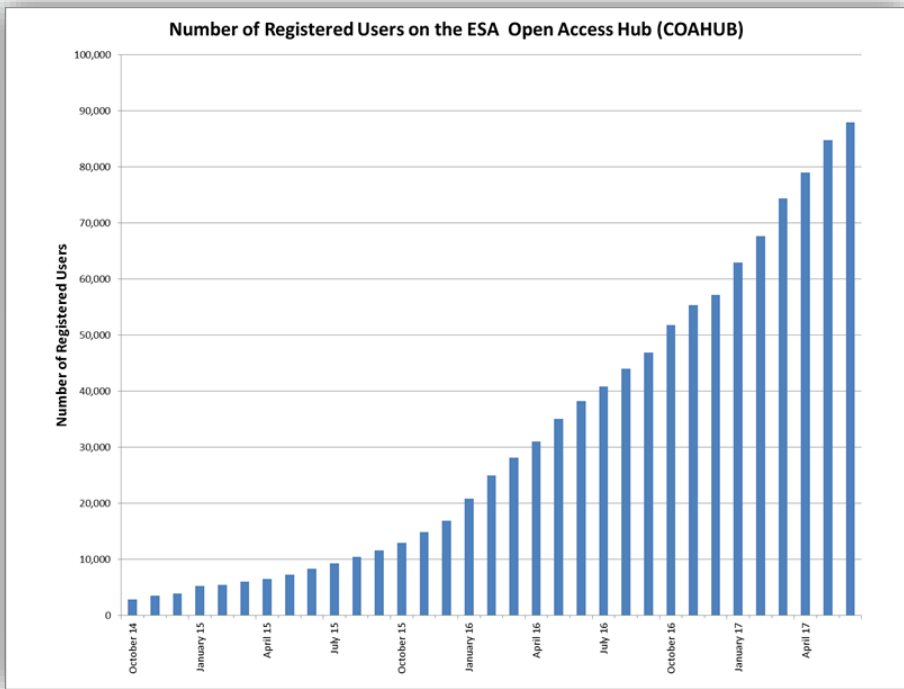


\* The Downstream and end user analysis includes only 8 value chains: Agriculture, Forestry, Urban Monitoring, Insurance, Ocean Monitoring, Oil & Gas, Renewable Energies and Air Quality. Estimates for end users were only calculated for Insurance, Oil&Gas and Urban Monitoring. The estimates of downstream 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



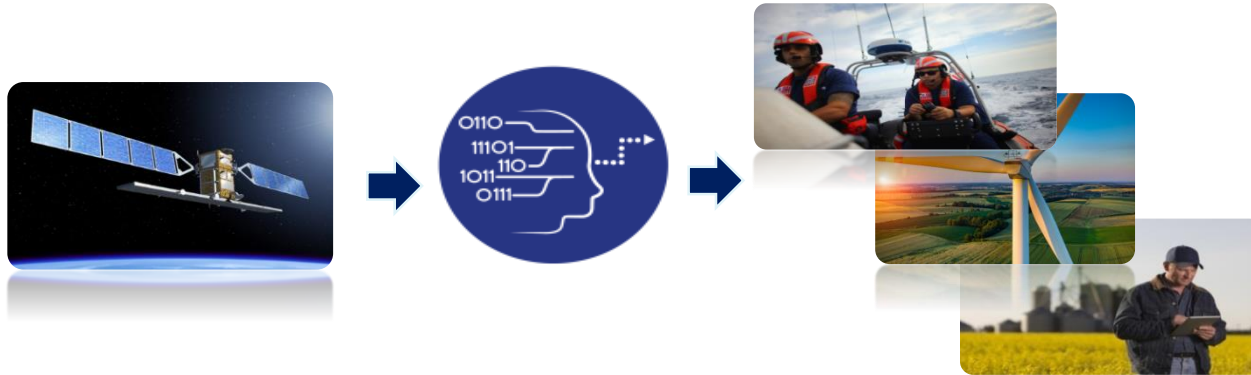
User  
Uptake

# 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



User  
Uptake

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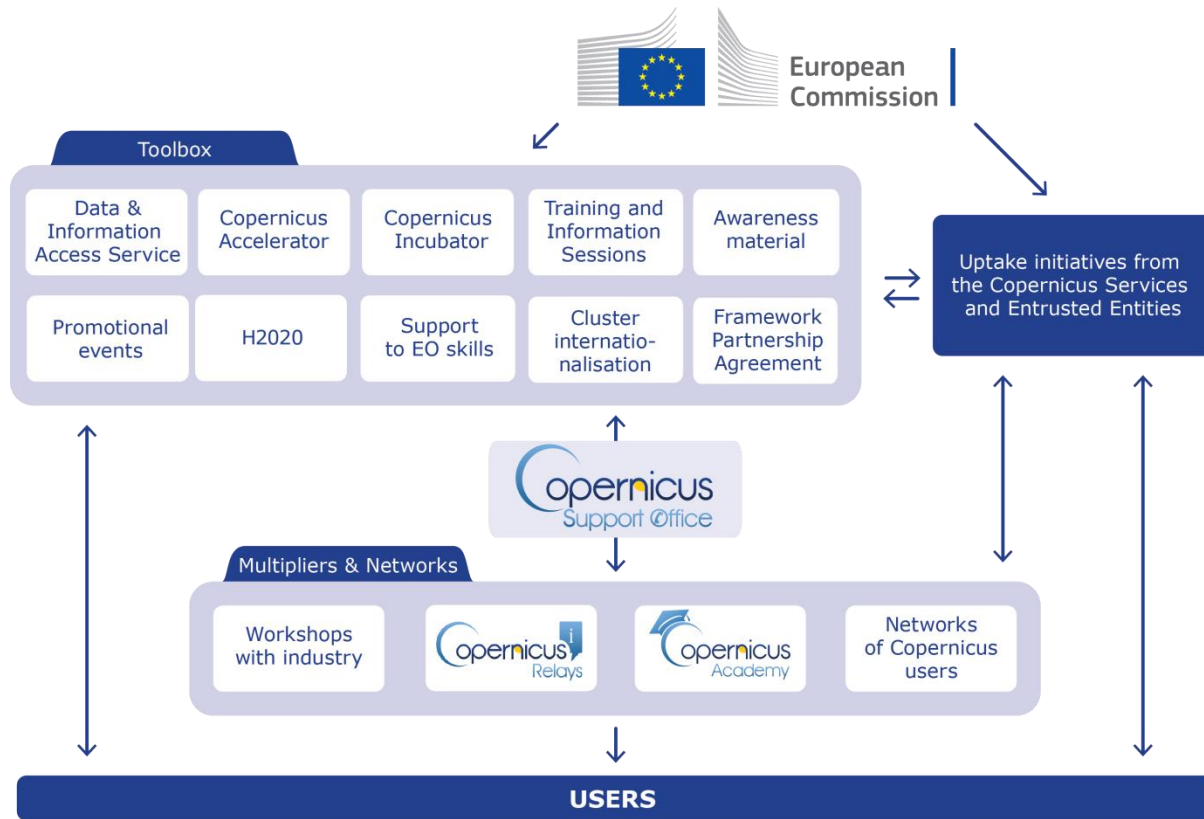
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## User Uptake

# Copernicus User Uptake Initiatives



# Copernicus Networks

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## 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

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## 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](mailto:support@copernicus.eu)



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

## NORWEGIAN RELAYS:

- **NERSC** - Nansen Environmental and Remote Sensing Center + **MET** - Institute of Marine Research (IMR)
- **NINA** - Norwegian Institute for Nature research
- **SIOS** - Svalbard Integrated Arctic Earth Observing System

## NORWEGIAN ACADEMY:

- **NERSC**
- **NTNU** - Norwegian University of Science and Technology



User  
Uptake

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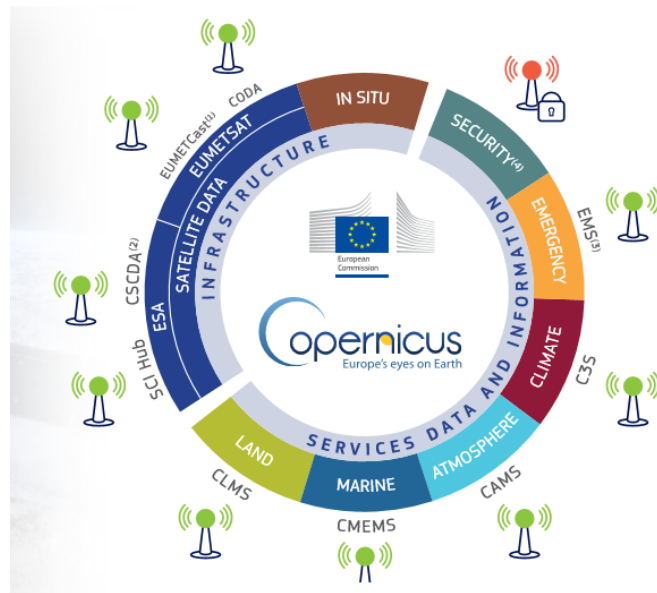
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Leverage with  
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Entities



# 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.



Data  
Access

# Copernicus Big Data Approach

## THE DIAS & WHERE TO REACH THEM

**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 COSMOS

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





User  
Uptake

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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

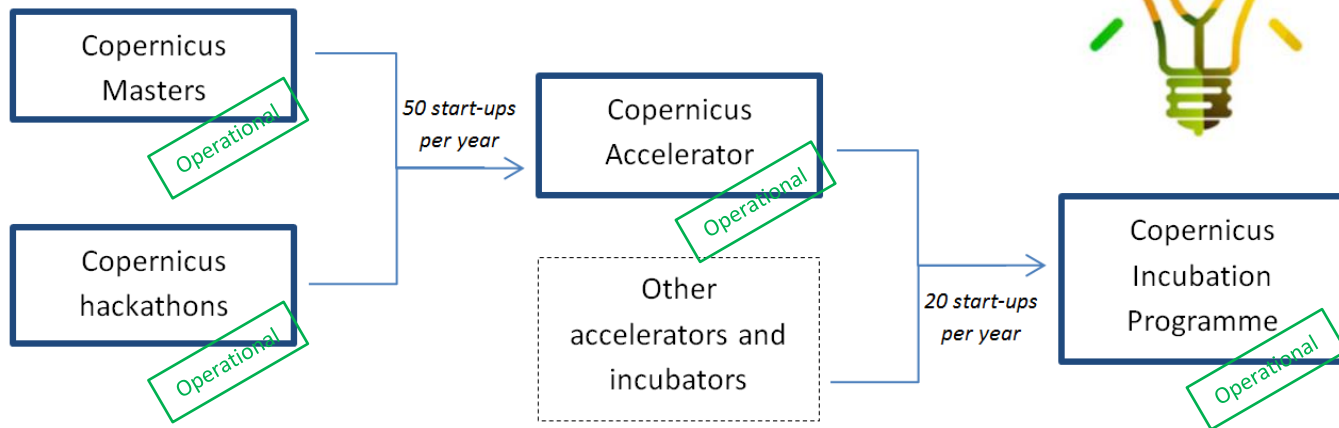


User  
Uptake

## 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

- A competition for **start-ups** developing applications based on Copernicus
- **16 prizes**, 600k prize pool (cash, business incubation, technical assistance...)
- Award ceremony: **December – Marseille**
- Application to the 2019 Masters 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
- 2<sup>nd</sup> 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
  - Winning a Copernicus Hackathon
  - Applying 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
- **Cooperation with KICs:**
  - Post-doc scholarships awarded in partnership with KIC raw material
  - "Journey": summer course organised in June-July with Climate KIC
- **Ongoing ERASMUS+ sectoral skill alliance for Earth Observation** (with several Copernicus Relays)
- **Forthcoming Copernicus awareness campaign in universities** (in partnership with COSME)

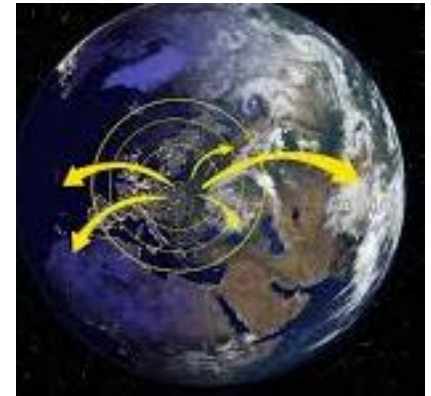


User  
Uptake

# 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:**
  - Monitoring CO<sub>2</sub> 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:
  - HR thermal infrared observations
  - Hyperspectral measurements
  - SAR L-band observations

These results do not present a commitment of the Commission



# Thank you

*Any questions? email me:*  
***[stefano.la-terra-bella@ec.europa.eu](mailto:stefano.la-terra-bella@ec.europa.eu)***