



Copernicus

General Overview

Dinka DINKOVA – Deputy Head of Unit

European Commission – Space Data for Societal Challenges & Growth
Copernicus Information and Training Session - Sofia, 17 April 2018



Copernicus

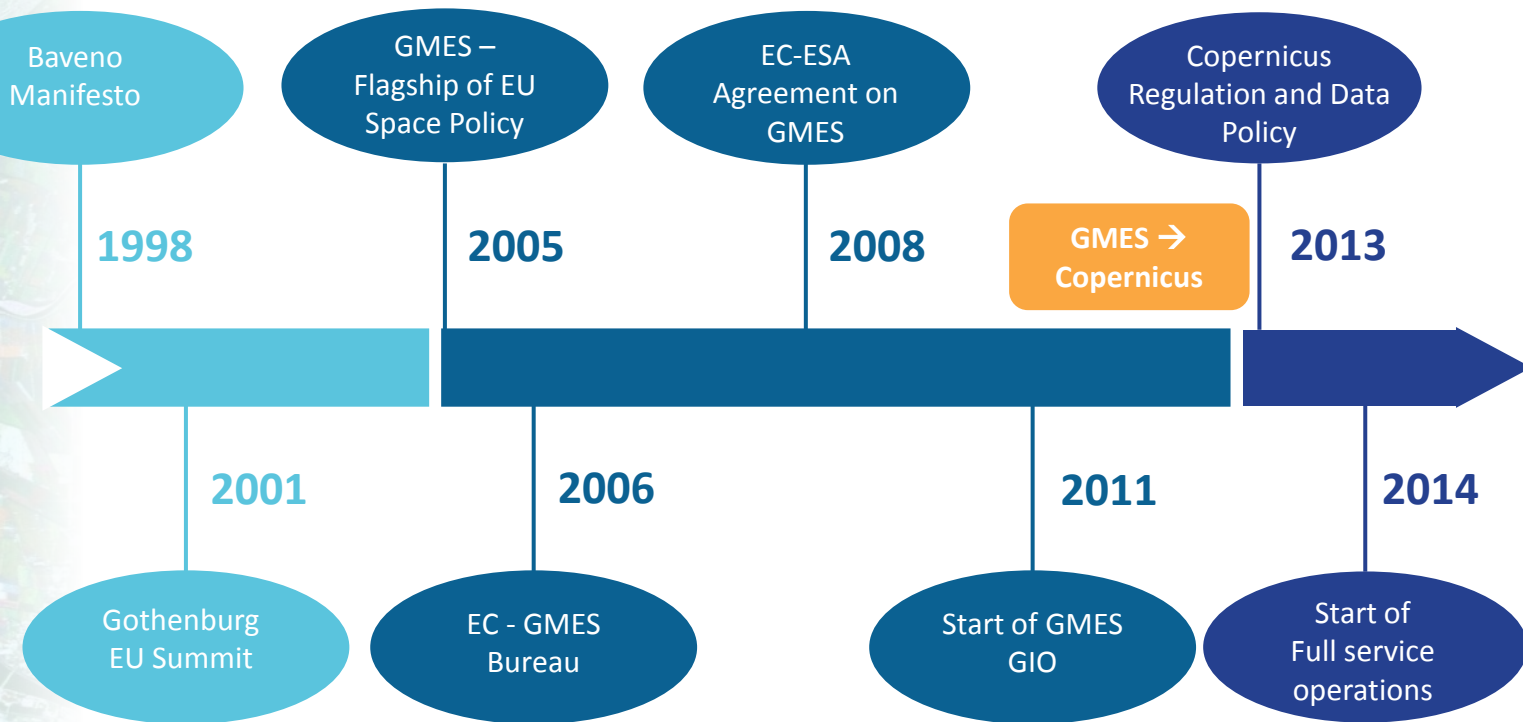
C O P E R N I C U S I N B R I E F

- **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**



Copernicus

COPERNICUS HISTORY

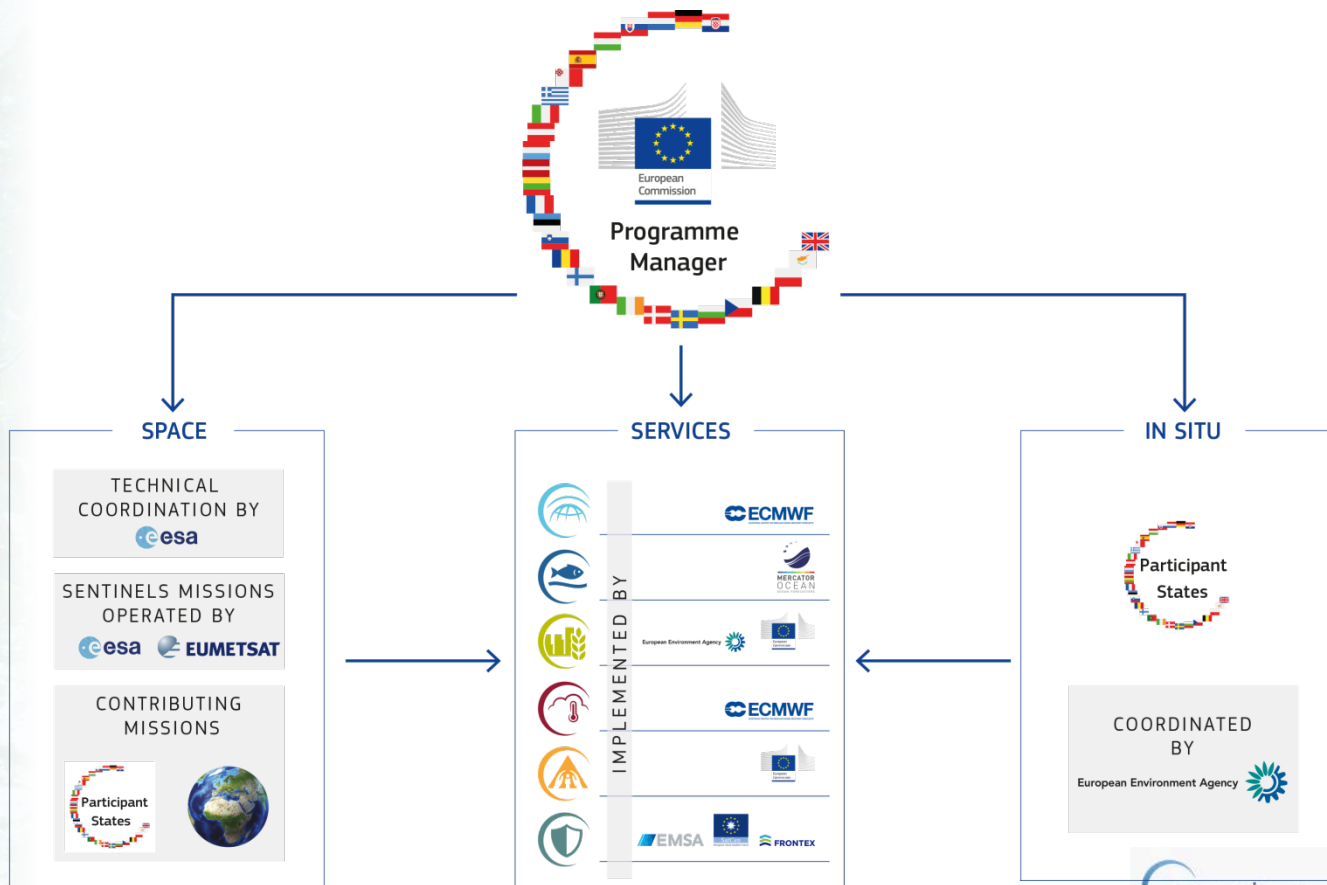


GIO = GMES Initial Operation



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COPERNICUS GOVERNANCE





Copernicus

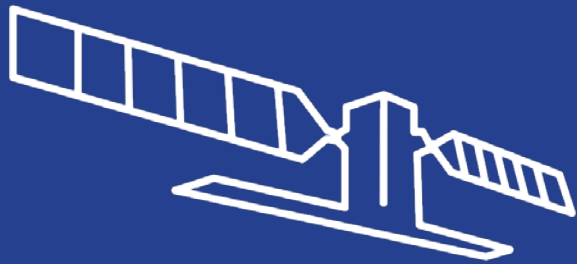
THE COPERNICUS ECOSYSTEM

- **The most advanced EO programme, created to answer European and global societal challenges** – e.g. climate change, natural disasters, sustainable development...
- **3 components** – space infrastructure, Copernicus services, in-situ component
- **Six operational services** serving a community of users worldwide



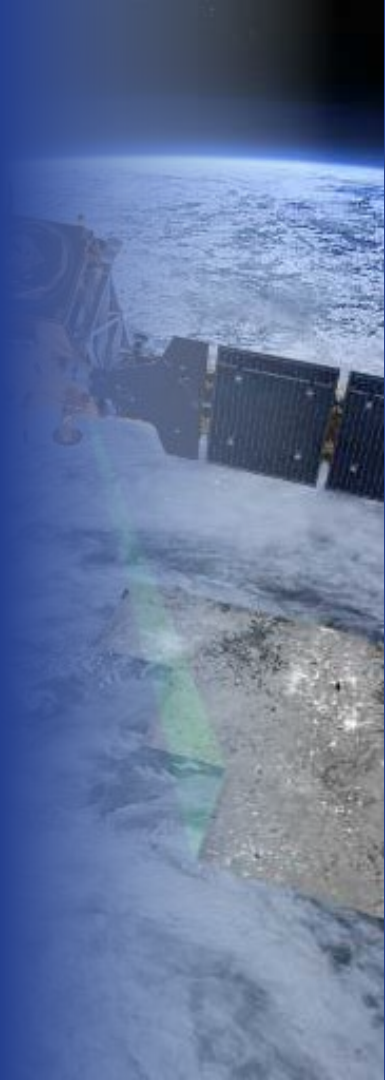
Full, free and open access to Copernicus data and information

www.copernicus.eu



Space Component

Copernicus Space Component





Space
Component

THE SENTINELS



SENTINEL-1:
4-40m resolution, 3 day revisit at equator

***S1A and 1B
in orbit***



SENTINEL-2:
10-60m resolution, 5 days revisit time

***S2A and 2B
in orbit***



SENTINEL-3:
300-1200m resolution, <2 days revisit

***S3A in orbit
S3B
25/4/2018***



SENTINEL-4:
8km resolution, 60 min revisit time

***1st Launch
2020***



SENTINEL-5p:
7-68km resolution, 1 day revisit

***S5P launched
13/10/2017***



SENTINEL-5:
7.5-50km resolution, 1 day revisit

***1st Launch
2021***



SENTINEL-6:
10 day revisit time

***1st Launch
2020***

Key Features

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

Polar-orbiting, multispectral
optical, high-resolution 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 Sentinel 5

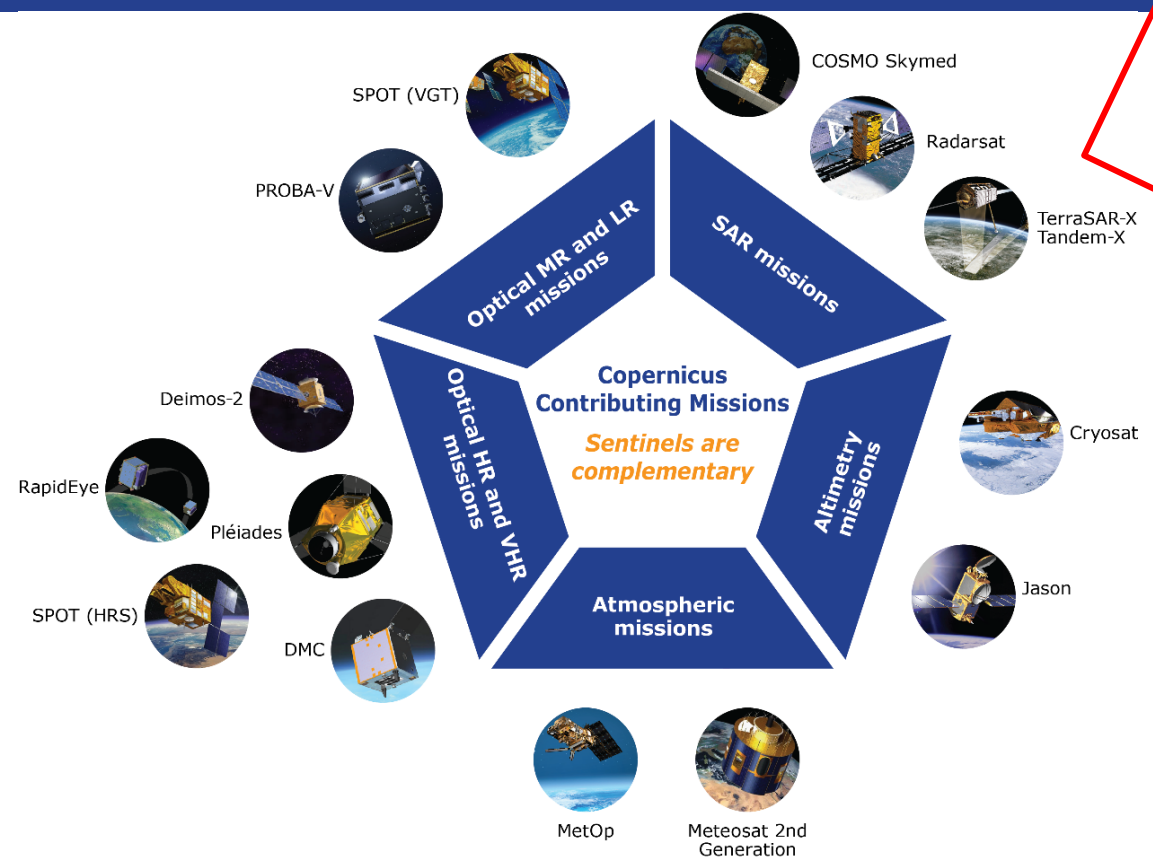
Payload for atmosphere chemistry
monitoring on MetOp 2ndGen

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, 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





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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

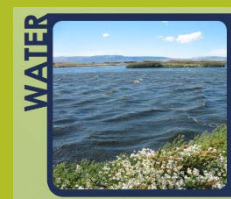
Energy

Natural Resources

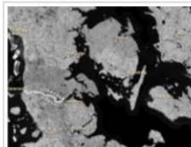
Water

Urban planning

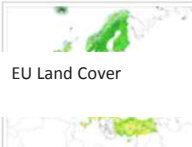
Global



Pan-European



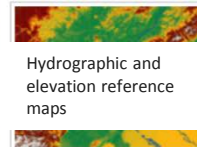
[Image Mosaics](#)



[CORINE Land Cover](#)



[High Resolution Layers](#)



[Reference Data](#)

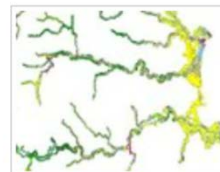


[Related Pan-European products](#)

Local



[Urban Atlas](#)



[Riparian Zones](#)



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



Marine
Monitoring

Benefit areas and products examples

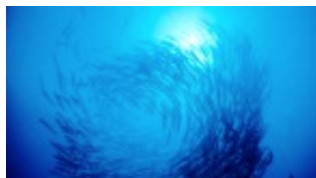
Marine safety

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

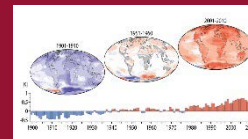
**Consistent Estimates of the
Essential Climate Variables (ECVs)**



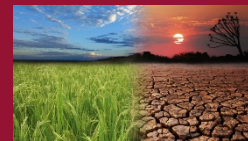
**Support to Mitigation and
Adaptation Strategies**



**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





Socio-economic benefits of Copernicus

User Uptake





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



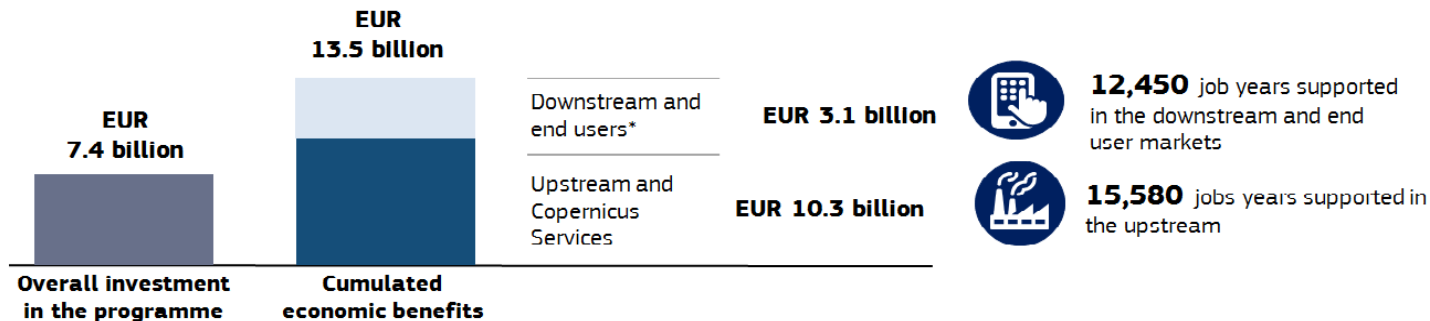
~50.000 jobs
maintained/
created in the
next 15 years



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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



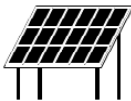
60% Higher accuracy for analysis of the impact of trans-boundaries pollutants on air quality



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

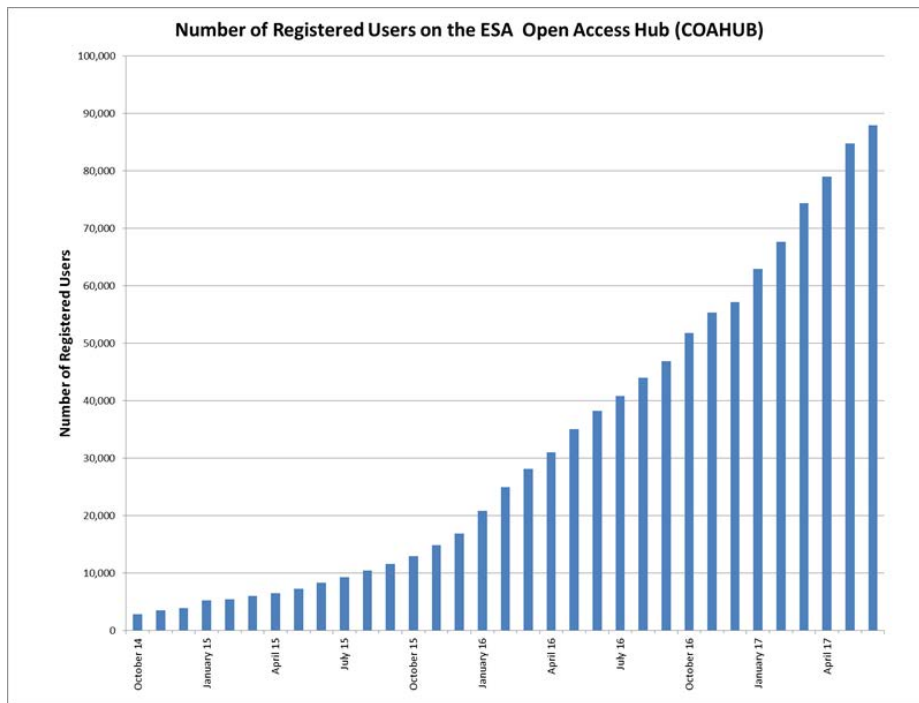


* The Downstream and end user analysis includes only 8 value chains: Agriculture, Forestry, Urban Monitoring, Insurance, Ocean Monitoring, Oil & Gas, Renewable Energies and Air Quality. Estimates for end users were only calculated for Insurance, Oil&Gas and Urban Monitoring. The estimates of downstream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



User Uptake

The uptake of Copernicus is very strong



➔ Unprecedented growth in number of Sentinel users

➔ Similar trend in the Copernicus services



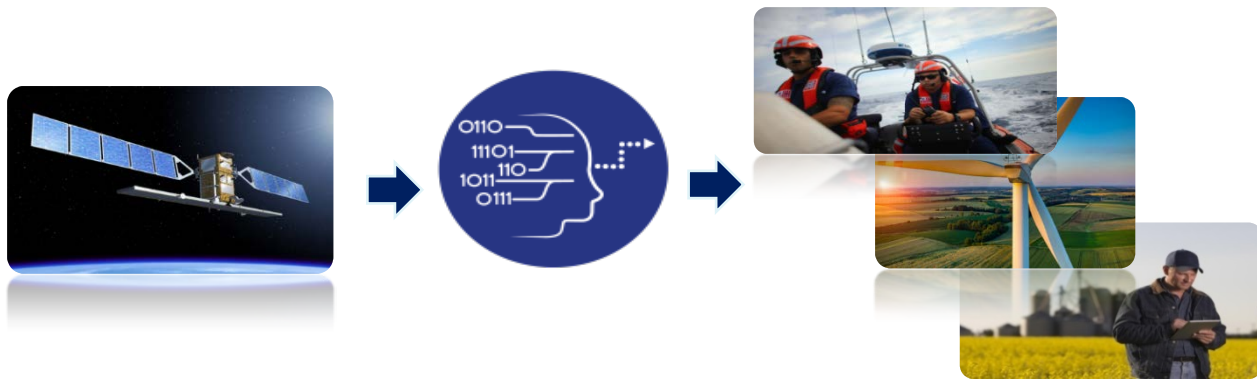
User
Uptake

The Commission's 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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User
Uptake

Pillar 1: Awareness

- **Information and training sessions (1200+ participants)**
- **Development of dedicated communication materials** (Video, website, factsheets)
- **Development of new channels of communication** (Social Media)
- **Organisation of events** (High-level events, Business Oriented, public oriented)
- **Publication of dedicated studies** (1st Copernicus Market Report - identifying benefits in 8 sectors)
- **Copernicus Relays and Academy Networks**



Copernicus Networks

Copernicus Relays

- 80 Relays
- 33 countries
- 4 continents

Copernicus Academy

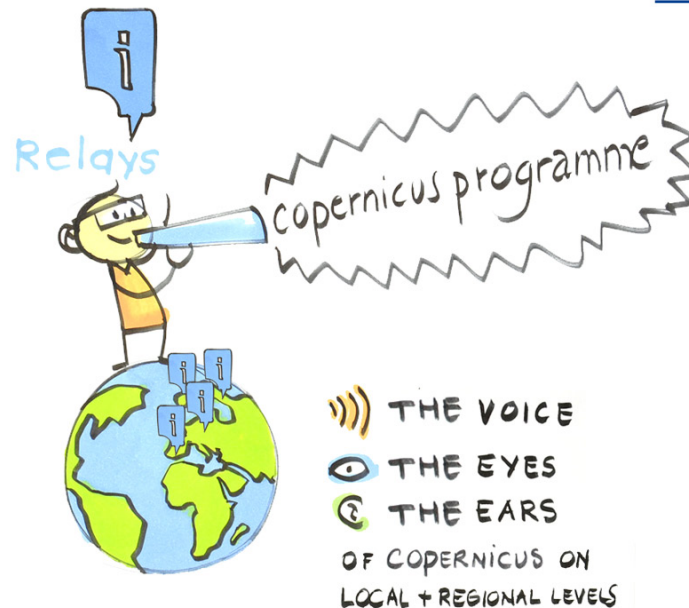
- 125 Academy members
 - 34 countries
 - 3 continents



Copernicus Relays

- Reaching end-users in different countries and regions worldwide
- Content localization
- Local and global cooperation
- Support to local users
- Organising promotional events and training

JOIN THE COPERNICUS RELAYS NETWORK !



THE MEMBERS OF THIS NETWORK ARE BRIDGES BETWEEN COPERNICUS AND THE END-USERS OF THE PROGRAMME INCLUDING BUSINESSES, START-UPS AND THE EU CITIZENS

Copernicus Academy

- Reaching academic institutions worldwide
- Enabling global Earth Observation research network
- Promoting space in education
- Accelerate research to market link
- Building skills

JOIN THE COPERNICUS ACADEMY



THE MEMBERS OF THIS NETWORK ENSURE THAT SKILLS ARE DEVELOPED TO ENABLE COPERNICUS TO UNLEASH ITS FULL POTENTIAL



Copernicus

Local members

Copernicus Relays in Bulgaria

- GEO Polymorphic Cloud - Vassil Vassilev, Nadya Tsvetkova
- RST-TTO, Bulgarian Academy of Science - Kamen Iliev



Copernicus Academy in Bulgaria

- Sofia University "St. Kliment Ohridski" Department of Meteorology and Geophysics – Assoc. Prof. Dr. Nikolay Rachev
- Space Research and Technology Institute - Bulgarian Academy of Sciences (SRTI-BAS) - Assoc. Prof. Dr. Lachezar Filchev





User
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User
Uptake

Pillar 2: Access

- **Enhanced distribution (Open hub)**
- **Data and Information Access Services (DIAS)**
operational from Q3 2018
- **Copernicus Support Office**
 - 2000+ ticket handled
 - replies within few hours
 - animates Relays and Academy networks



Copernicus Support Office

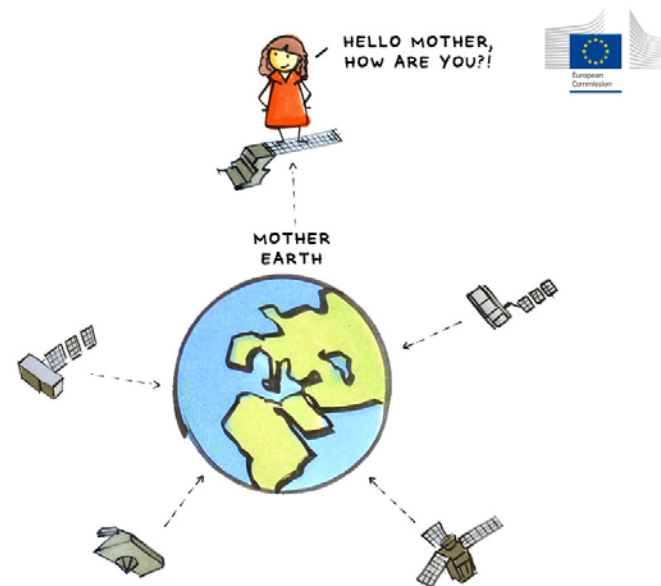


support@copernicus.eu



Ask on Twitter
@CopernicusEU

+359 24 916 040



Questions about Copernicus?
Ask the Copernicus Support Office team!



SUPPORTS AND MONITORS THE DEVELOPMENT
OF KEY COPERNICUS MARKET DEVELOPMENT
INITIATIVES LAUNCHED BY THE EUROPEAN COMMISSION



User
Uptake

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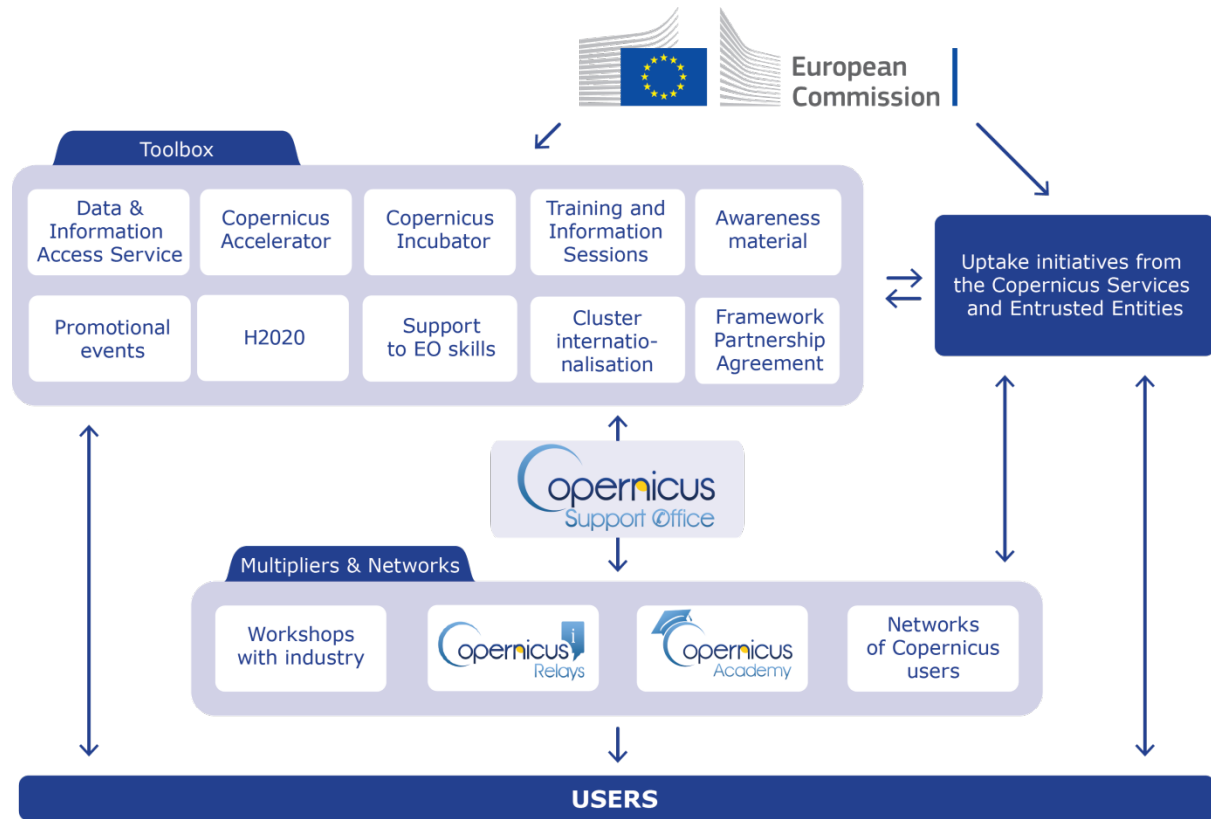
III) Support **downstream** actors (public authorities, businesses and researchers)

Leverage with
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User Uptake

COPERNICUS USER UPTAKE INITIATIVES



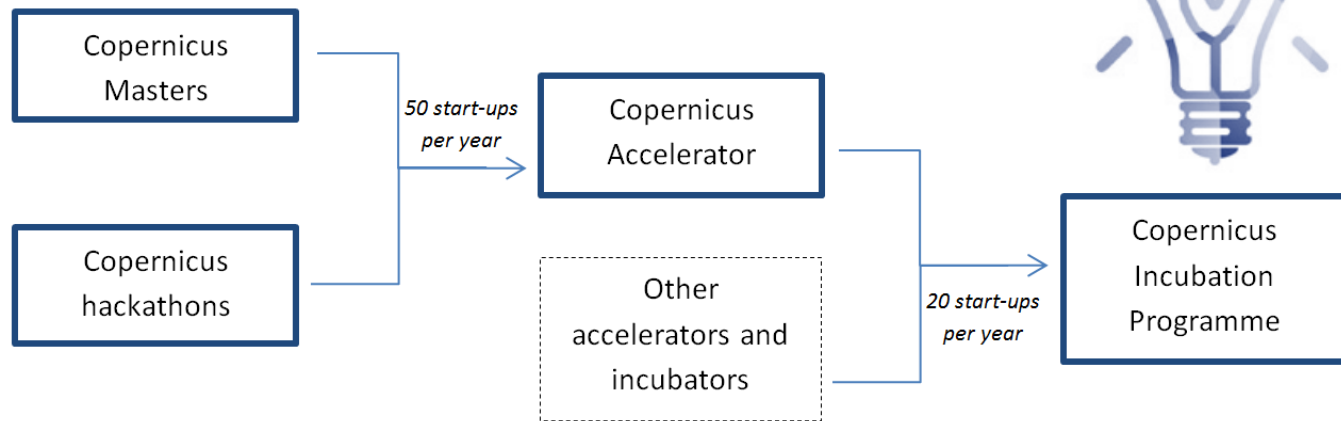


User
Uptake

Pillar 3: downstream 1/5

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

- **Copernicus start-up programme**





User
Uptake

Pillar 3: downstream 2/5

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...);
- New contract is about to be launched





Pillar 3: downstream 3/5

Copernicus Hackathon Programme

- 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;
- New contract is about to be launched





Pillar 3: downstream 4/5

Copernicus Accelerator

- Since **November 2016** for **50 start-ups**.
- Each start-up receives a mentor for the duration of the programme, and works towards a **business objective** (e.g. entering an incubator, getting a first client...);
- Start-ups also receive monthly online courses and interaction with their mentor.
- New contract is about to be launched





Pillar 3: downstream 5/5

Copernicus Incubation Programme

- The European Commission finances the **incubation of 20 start-ups per year**;
- 50K voucher to spend on **business development**;
- 54 application received for phase 1





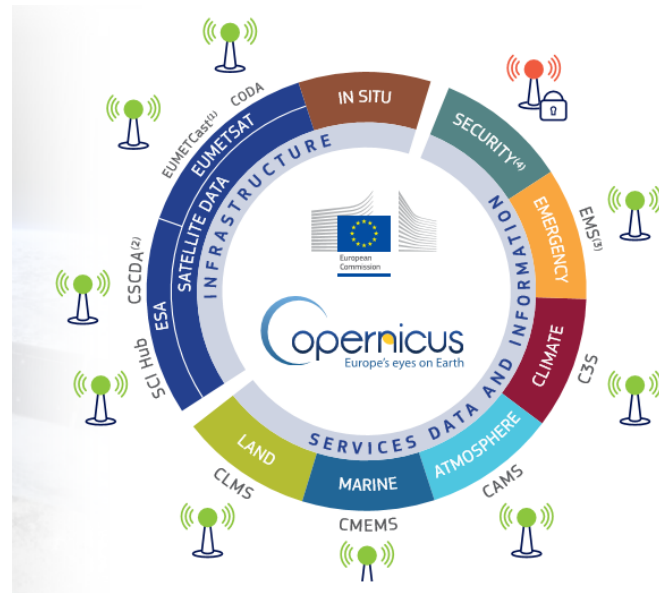
Access to Copernicus Data

Data Access



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 DATA ACCESS: KEY LINKS

Access to Satellite data


FULL, FREE AND OPEN



Scientific and Other Access

<https://scihub.copernicus.eu/>

esa



*Copernicus Space Component
Data Access Portal**
CSC-DA

<https://spacedata.copernicus.eu/>

FULL, FREE AND OPEN

EUMETSAT

- Copernicus Online Data Access (CODA)
- EUMETCast:
www.eumetcast.com
Needs to get a station and pay a yearly fee

Access to Copernicus Services Data

- Land-related data: <http://land.copernicus.eu>
- Atmosphere-related data: <http://atmosphere.copernicus.eu>
- Marine-related data: <http://marine.copernicus.eu>
- Emergency-related data: <http://emergency.copernicus.eu>
- Climate change-related data: <http://climate.copernicus.eu> (Beta version)

FULL, FREE AND OPEN

(*) Includes instructions on how to access Contributing Missions data



Data
Access

COPERNICUS BIG DATA APPROACH

Dual approach:

- Strong Copernicus Distribution Services for download
- Imminent launch of several **Data Access and Information Services (DIAS)**
 - Access to all Copernicus data and information collocated with cloud computing resources
 - Big Data analytics without the need to download the data and information
 - Data fusion with non-EO data and information



Overall ensuring that Copernicus data is easily accessible and used!

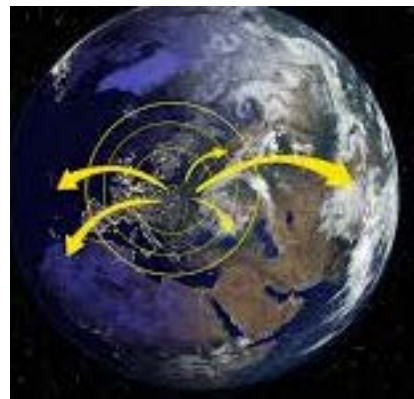


Copernicus

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 EO companies**
- In past 2 weeks we have included **1.6 billion new potential users to 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 to meet emerging needs:**
 - Monitoring CO₂ and other greenhouse gas emissions
 - Climate change and sustainable development
 - Changes in the Arctic
- **Next generation of satellites:** evaluation on-going to define observation needs in cooperation with users - e.g. GHG monitoring, thermal infrared, hyperspectral



Copernicus

CONCLUSIONS

The Union **Earth Observation** and monitoring programme

Increase general knowledge
on the state of the Planet



Protect people
and assets



Improve environmental
policy effectiveness



Facilitate adaptation
to climate change



Monitor
the environment



Foster downstream
applications in
a number of fields



Help managing emergency
and security related situations



Thank you!

*For questions email me at:
dinka.dinkova@ec.europa.eu*