

The EU Earth Observation Programme Copernicus

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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

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



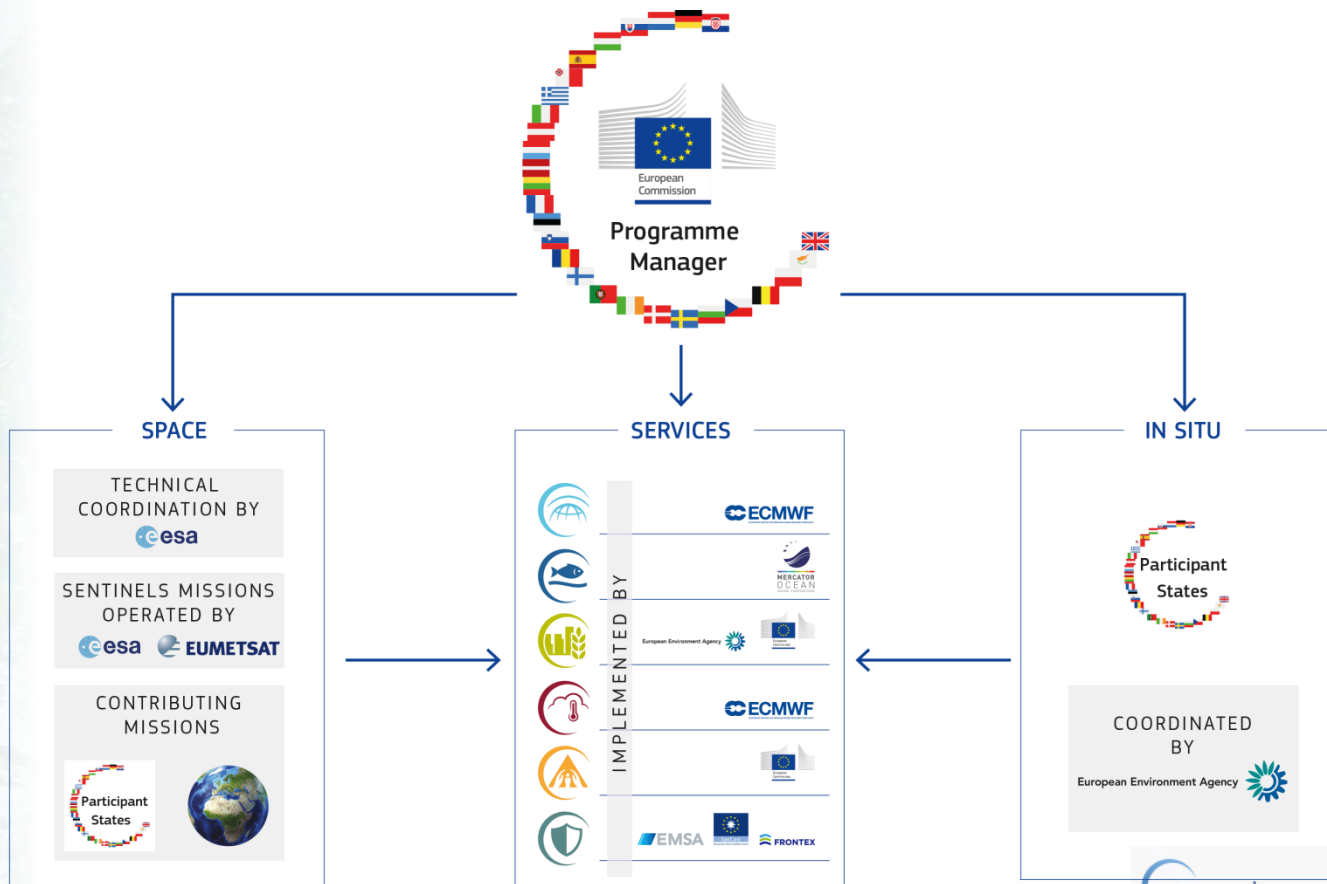
A tool for economic growth
and a driver for the **digital economy**





Copernicus

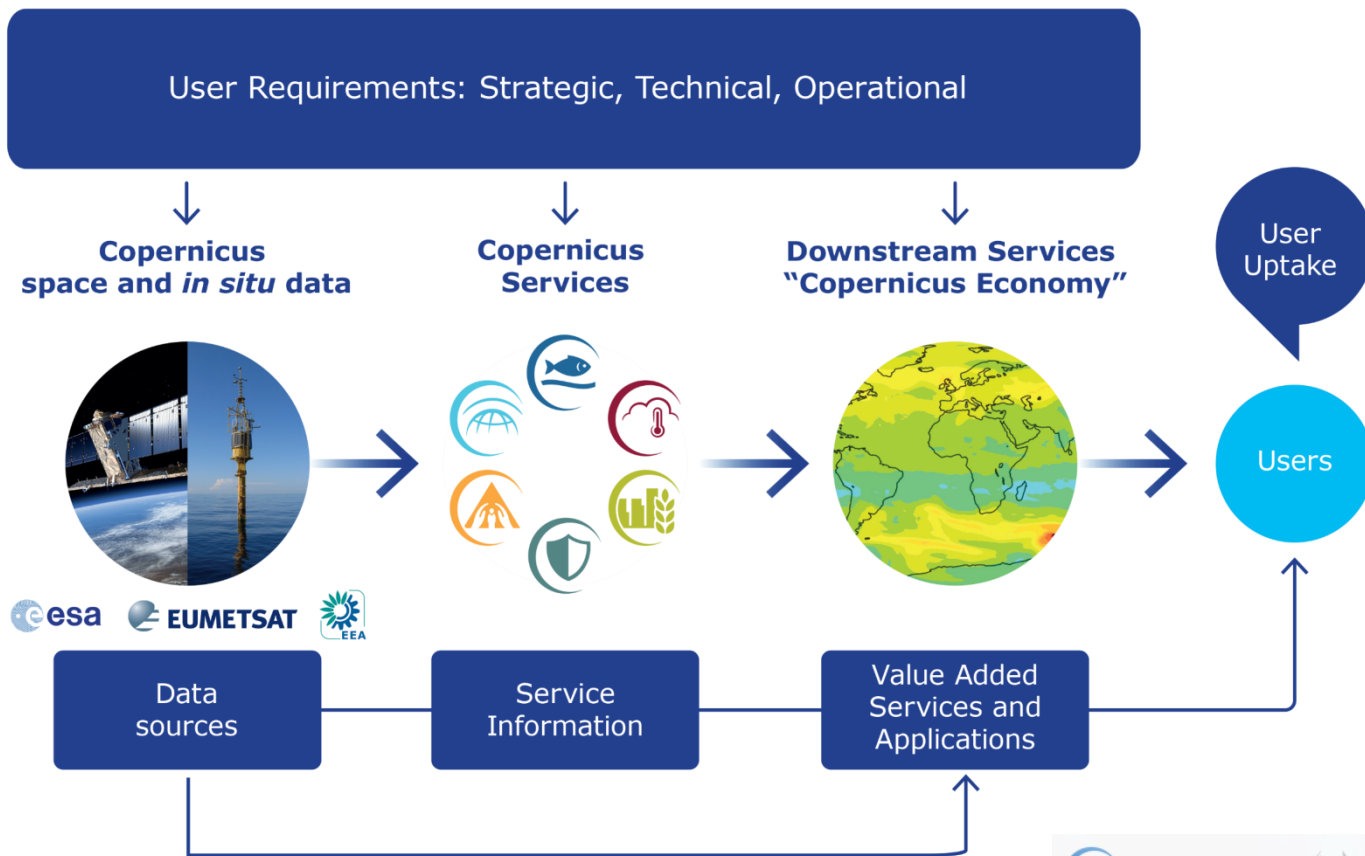
COPERNICUS GOVERNANCE





Copernicus

COPERNICUS IS DRIVEN BY THE USERS





Copernicus

THE SENTINELS

Key Features



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

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



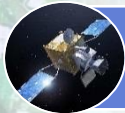
SENTINEL-2:
10-60m resolution, 5 days revisit time

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



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

***S3A in orbit
S3B in orbit***



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

*1st Launch
2020*



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

S5P in orbit



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

*1st Launch
2021*



SENTINEL-6:
10 day revisit time

*1st Launch
2020*

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

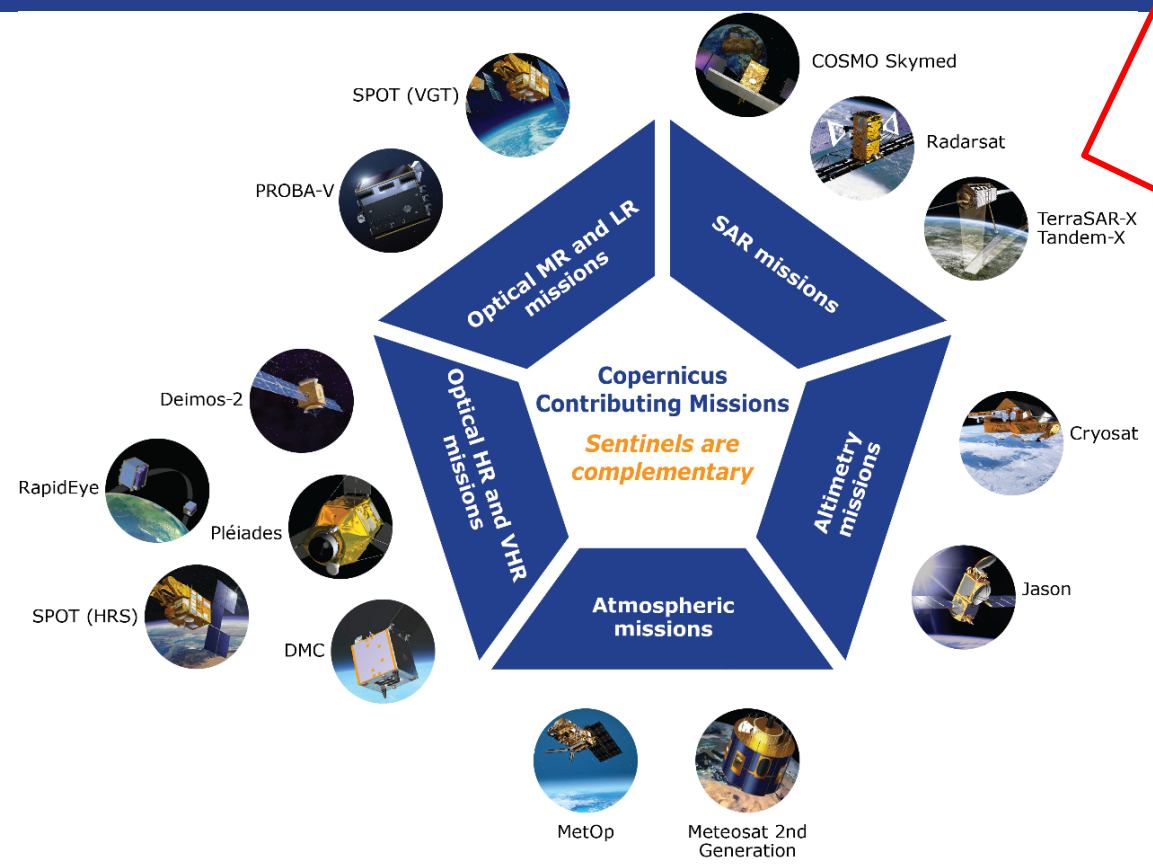
Payload for atmosphere chemistry
monitoring on MetOp 2ndGen

Radar altimeter to measure sea-
surface height globally



Space
Component

THE CONTRIBUTING MISSIONS



Subject to Data
Owner's Data
Policy



In situ

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

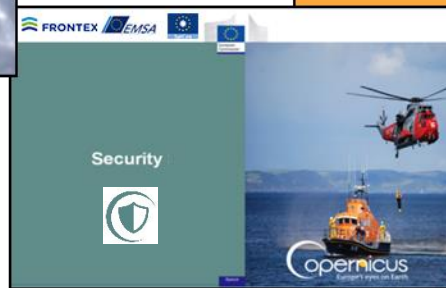




Copernicus

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

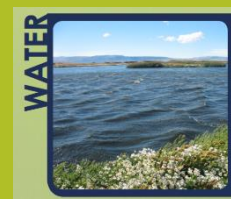
Energy

Natural Resources

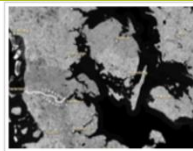
Water

Urban planning

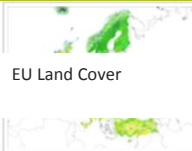
Global



Pan-European



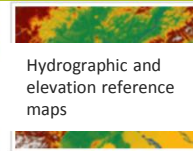
[Image Mosaics](#)



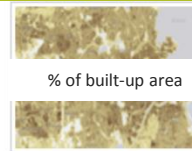
[CORINE Land Cover](#)



[High Resolution Layers](#)



[Reference Data](#)

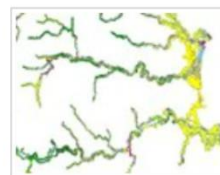


[Related Pan-European products](#)

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

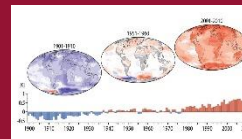
**Consistent Estimates of the
Essential Climate Variables (ECVs)**



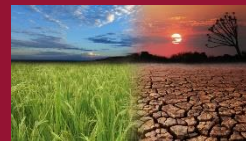
**Support to Mitigation and
Adaptation Strategies**



**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

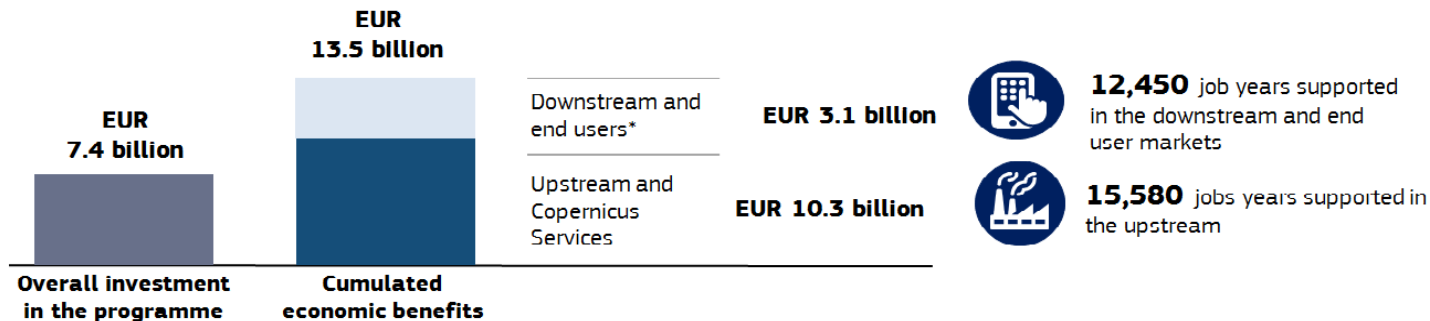




Copernicus

COPERNICUS MONETARY 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



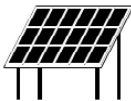
60% Higher accuracy for analysis of the impact of trans-boundaries pollutants on air quality



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.



Copernicus

COPERNICUS BROADER BENEFITS

Climate change & Environment



Security & Defence



Health



Blue economy



Energy & Natural resources



Development & Cooperation



Tourism



Insurance & Disaster management



Urban planning...



Forestry...





EXAMPLE OF COPERNICUS BENEFITS



Pipeline Infrastructure
Monitoring in the
Netherlands

Benefits for the
Netherlands:
€15 to €18 M/year



Forest Management in
Sweden

Benefits for Sweden:
€16 to €22 M/year



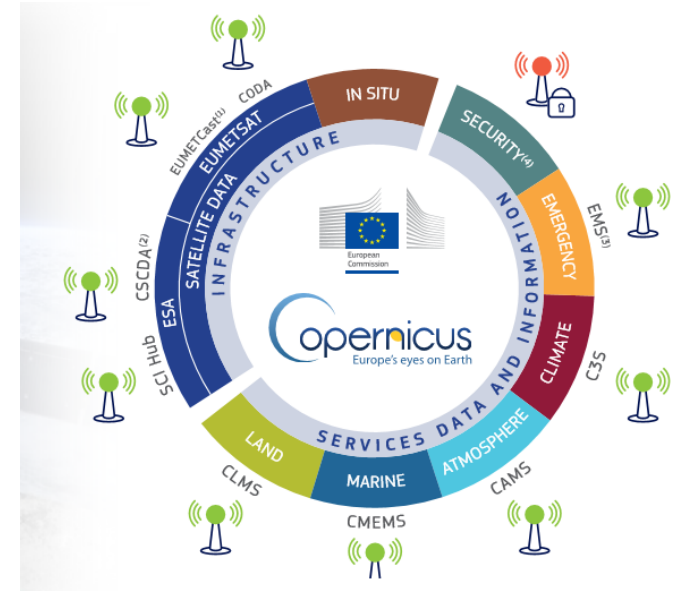
Winter Navigation in the
Baltic

Benefits for Sweden
and Finland:
€24 to €106 M/year



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.



User
Uptake

THE BIG DATA CHALLENGE

- Massive amounts of data
- Full, open and free-of-charge



Over 10 Petabyte/year
of new data

with just Sentinels-1, -2
and -3 fully operational
(data are downloaded
many time over)

- Different types of **dissemination** infrastructures
- **New technology** developments
- ICT and EO **cross-fertilisation**
- **Interoperability** with non-EO datasets
- Global EO **competition**
- Growth and jobs in **downstream** sector

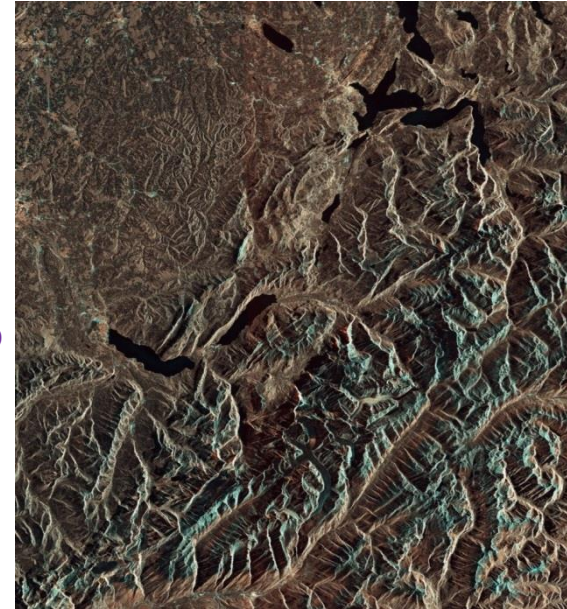


User
Uptake

C O P E R N I C U S B I G D A T A A P P R O A C H

Dual approach :

- Strengthening Copernicus Distribution Services for search, view, download
- 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,...)





User
Uptake

Facilitating Data Access

- **Enhanced distribution (Open access hub):** Upgrading the capacity of the distribution system, in particular with stronger linkages to Géant
- **Data and Information Access Service (DIAS)** now operational.
- **Copernicus Support Office:** a helpdesk available to all users



European
Commission





User
Uptake

Raising awareness about Copernicus

- **Information and training sessions**, organised with member states
- Extensive **communication** campaign (events, social media....)
- Publication of the **Copernicus Market Report**
- Signatures **International Agreements**





User
Uptake

Support to national and regional initiatives

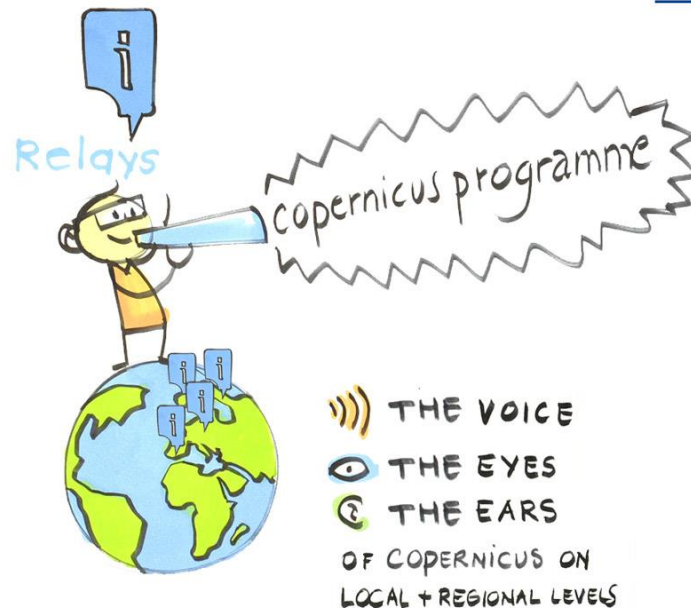
- Copernicus **Relays** and **Academy** acting as local ambassadors for Copernicus (worldwide more than 200 members).



Copernicus Relays

- Reaching end-users in different countries and regions worldwide
- Content localization
- Local and global cooperation
- Support to local users
- Organizing 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



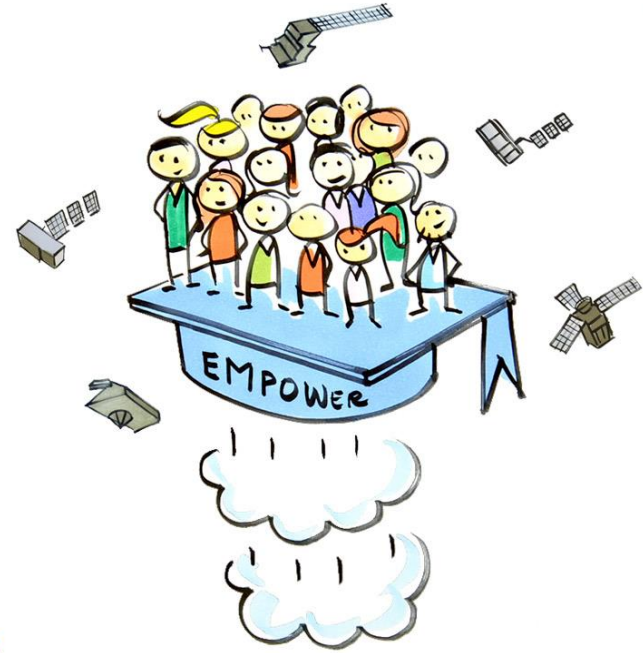
European
Commission



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

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European
Commission



Copernicus Networks

Copernicus Relays

- 80 Relays
- 33 countries
- 4 continents

Copernicus Academy

- 130 Academy members
 - 34 countries
 - 3 continents





Copernicus

CONCLUSIONS

The Union Earth Observation and monitoring programme

www.copernicus.eu

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