Copernicus

General Overview

Stefano La Terra Bella

European Commission – Space Data for Societal Challenges & Growth
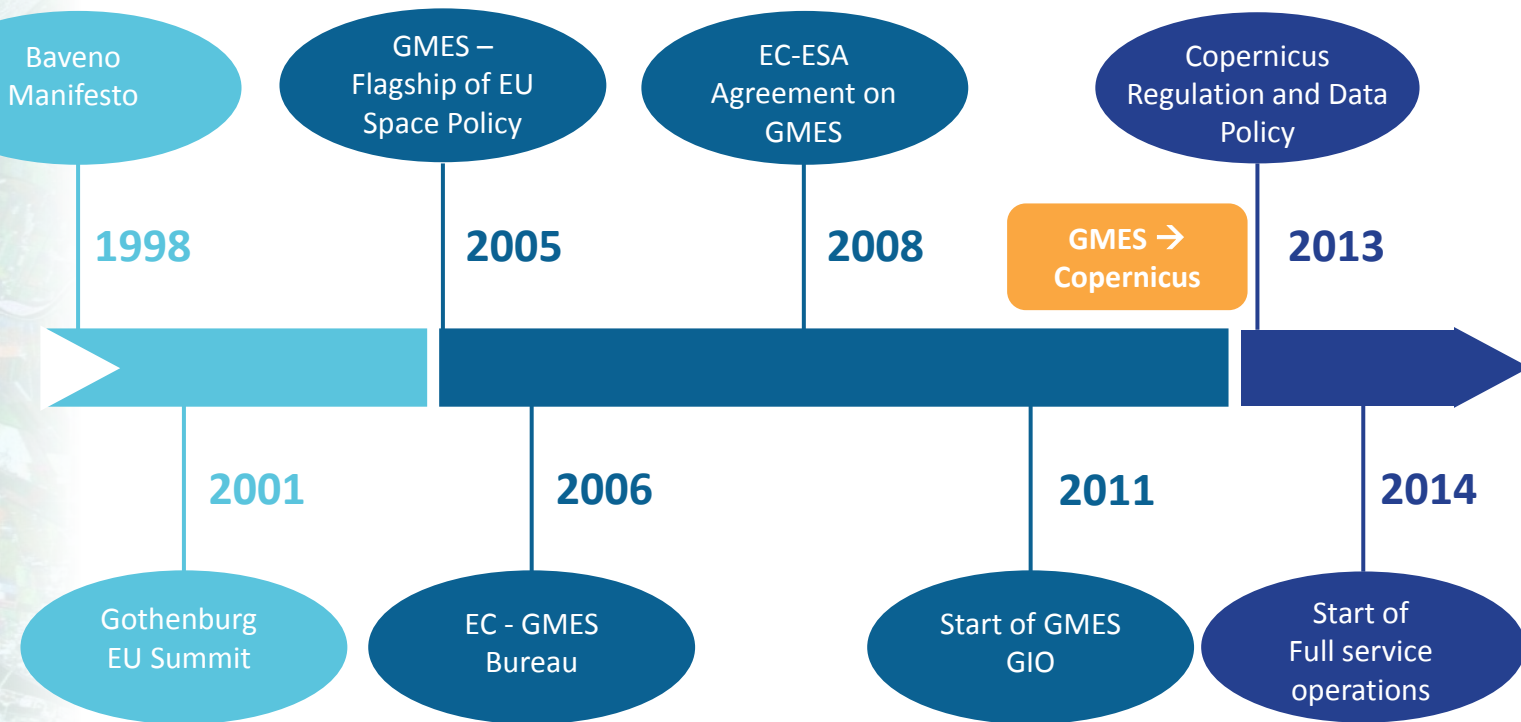*Copernicus Information and Training Session in Bratislava, 12 June 2018*

European Commission

Copernicus
Europe's eyes on Earth

Space

f Copernicus EU
Copernicus EU
You Tube Copernicus EU
www.copernicus.eu

- **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**
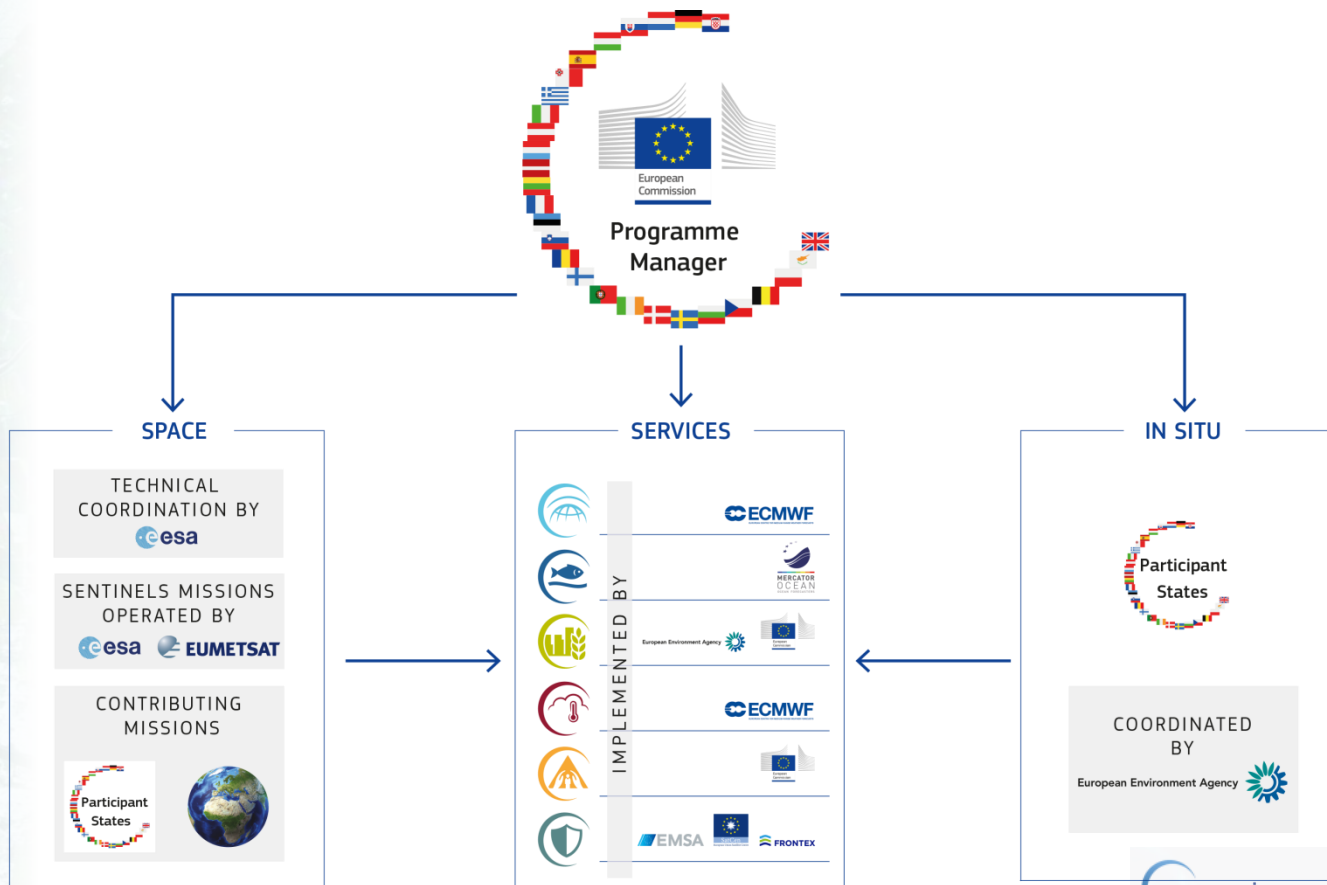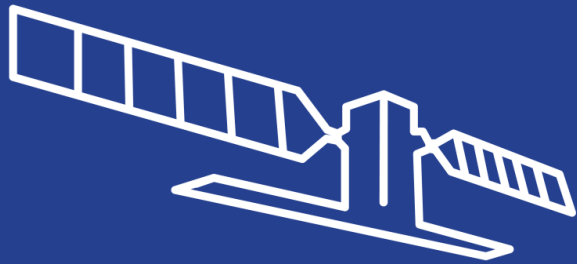
COPERNICUS HISTORY

Baveno Manifesto

GMES – Flagship of EU Space Policy

EC-ESA Agreement on GMES

Copernicus Regulation and Data Policy

1998 **2005** **2008** GMES → Copernicus **2013**

2001 **2006** **2011** **2014**

Gothenburg EU Summit

EC - GMES Bureau

Start of GMES GIO

Start of Full service operations

GIO = GMES Initial Operation

COPERNICUS GOVERNANCE

Programme Manager

SPACE

TECHNICAL COORDINATION BY
esa

SENTINELS MISSIONS OPERATED BY
esa   EUMETSAT

CONTRIBUTING MISSIONS

Participant States

SERVICES

IMPLEMENTED BY

ECMWF

MERCATOR OCEAN

European Environment Agency

ECMWF

EMSA   FRONTEX

IN SITU

Participant States

COORDINATED BY

European Environment Agency

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Space Component

Copernicus Space Component
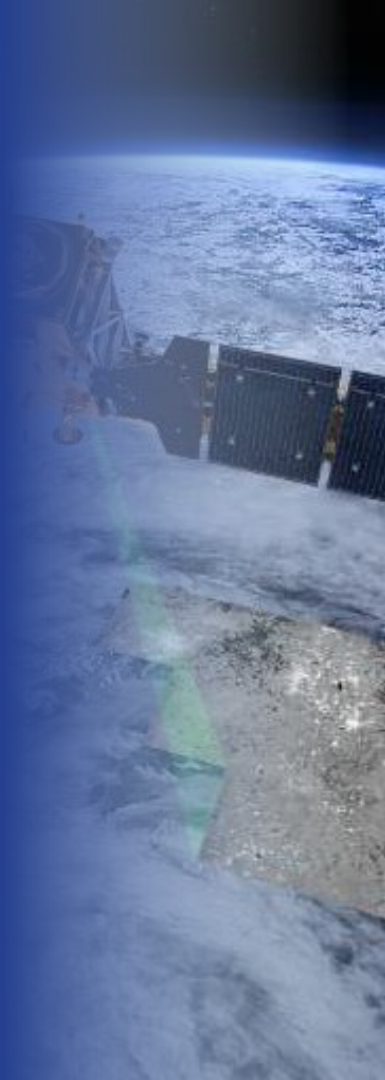
THE SENTINELS

Space Component

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	*1st Launch 2020*	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	*1st Launch 2021*	Payload for atmosphere chemistry monitoring on MetOp 2ndGen
SENTINEL-6: 10 day revisit time	*1st Launch 2020*	Radar altimeter to measure sea-surface height globally

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Europe's eyes on Earth

European Commission

Space Component

COSMO Skymed

SPOT (VGT)

Radarsat

PROBA-V

TerraSAR-X
Tandem-X
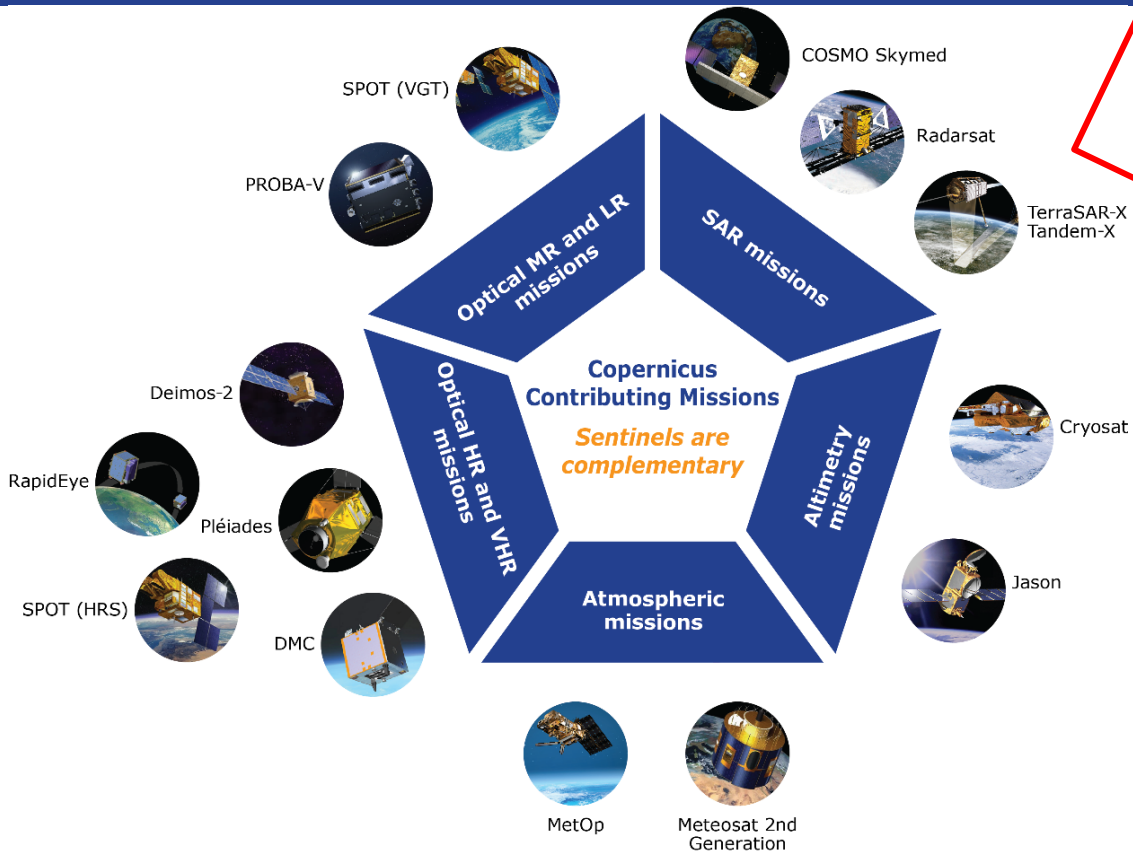
Subject to Data Owner's Data Policy

Optical MR and LR missions

SAR missions

Deimos-2

Optical HR and VHR missions

Copernicus Contributing Missions

Sentinels are complementary

Altimetry missions

Cryosat

RapidEye

Pléiades

SPOT (HRS)

Atmospheric missions

Jason

DMC

MetOp

Meteosat 2nd Generation

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

Copernicus

Monitoring the State of the Earth System Environment ...

Land Monitoring

Climate Change

Marine Environment Monitoring

Atmosphere Monitoring

Emergency Management

Security

... Six cross-cutting Thematic Services

Land Monitoring

Ecosystems
Biodiversity
Agriculture
Forestry
Energy
Natural Resources
Water
Urban planning

Global

VEGETATION

ENERGY

WATER

Pan-European

EU Land Cover

Specific land cover info

Hydrographic and elevation reference maps

% of built-up area
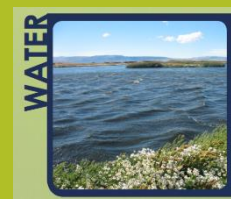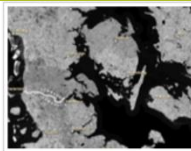
Image Mosaics
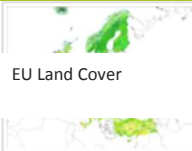
CORINE Land Cover

High Resolution Layers
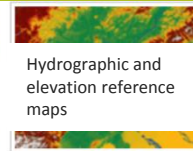
Reference Data
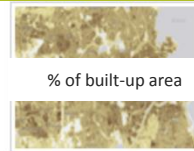
Related Pan-European products

Local

Urban Atlas
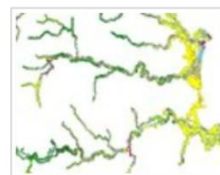
Riparian Zones

Natura 2000 (N2K)

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European Commission

Marine Monitoring

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, chlorophyil, biology, chemistry)

Atmosphere Monitoring

Health

Environment

Pollution

Climate

Renewable Energy

Air Quality and Atmospheric Composition

Climate forcing

Ozone layer & UV

Solar radiation

Emissions and surface fluxes

Copernicus
Europe's eyes on Earth

European Commission

Climate Change

Climate change

Mitigation and adaptation

Weather forecast

Pollution

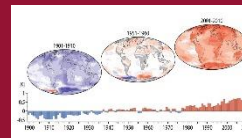**Environment**

Health

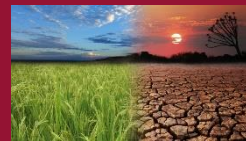**Consistent Estimates of the Essential Climate Variables (ECVs)**

Support to Mitigation and Adaptation Strategies

Global and Regional Reanalyses

Seasonal Forecasts And Climate Projections

Emergency Management

Disaster Emergency Situations

Humanitarian Crises

RESILIENCE

RECOVERY

EMERGENCY RESPONSE

PREPAREDNESS

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

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Europe's eyes on Earth

European Commission

Security

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

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Copernicus
Europe's eyes on Earth

European Commission

Socio-economic benefits of Copernicus

User Uptake

- 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
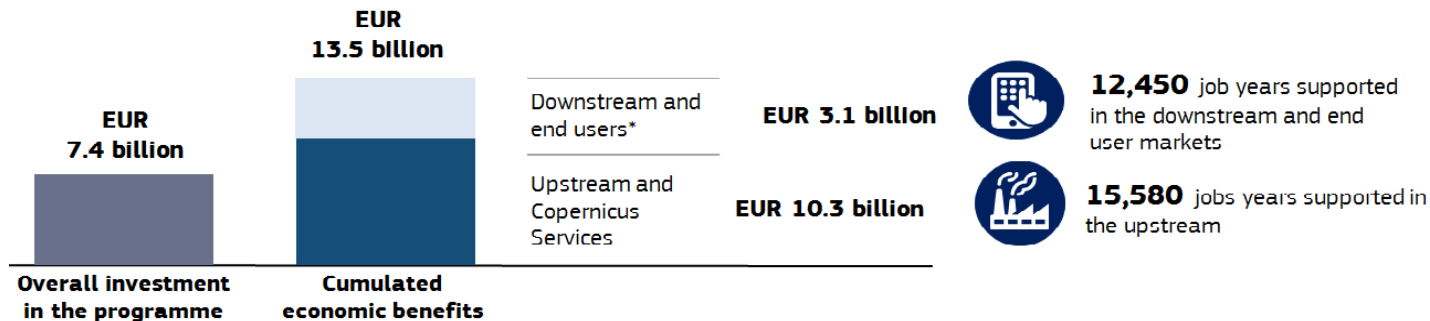benefits on
EU GDP =
~€30bn by 2030

~50.000 jobs
maintained/
created in the
next 15 years

Copernicus

Estimated direct monetary benefits between 2008 and 2020

EUR
13.5 billion

EUR
7.4 billion

| Downstream and end users* | EUR 3.1 billion |
| Upstream and Copernicus Services | EUR 10.3 billion |

Overall investment in the programme

Cumulated economic benefits

12,450 job years supported in the downstream and end user markets

15,580 jobs years supported in the upstream

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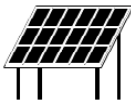
60% Higher accuracy for analysis of the impact of trans-boundaries pollutants on air quality

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

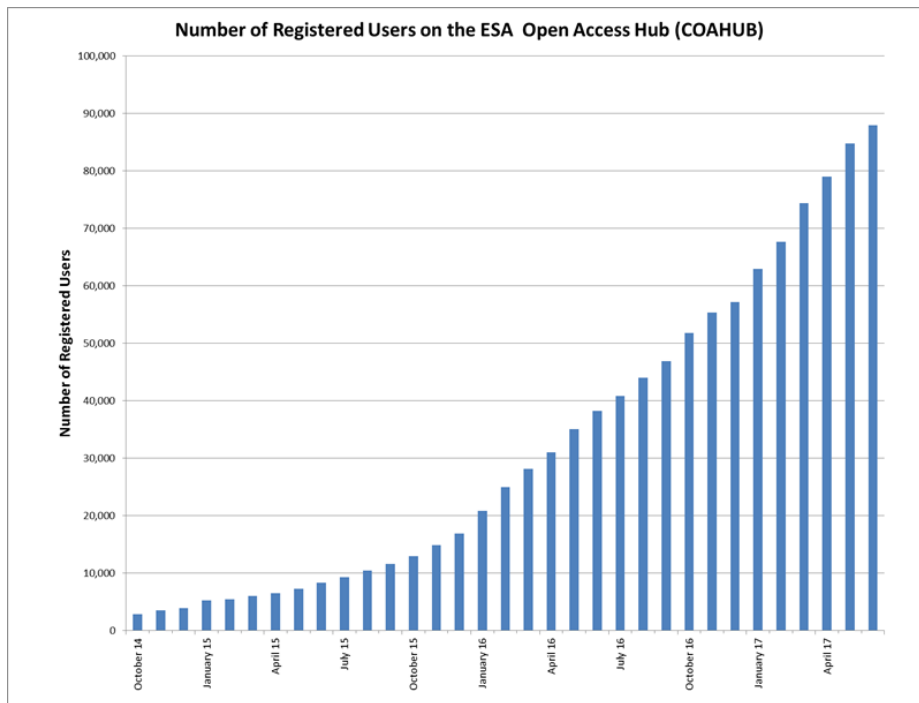**€ 186M** Benefits of Copernicus on the insurance market in 2015

* 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

Copernicus Europe's eyes on Earth

European Commission

User Uptake

Number of Registered Users on the ESA Open Access Hub (COAHUB)

➔ **Unprecedented growth in number of Sentinel users**
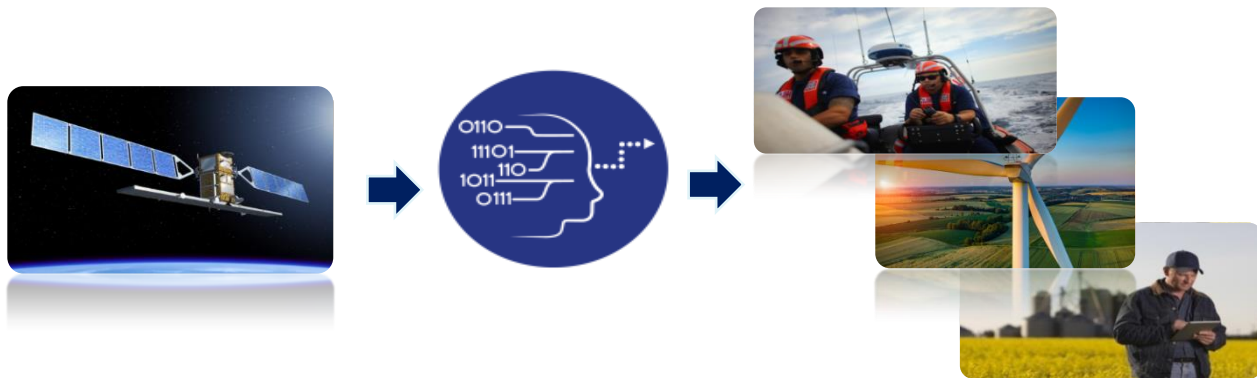
➔ **Similar trend in the Copernicus services**

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

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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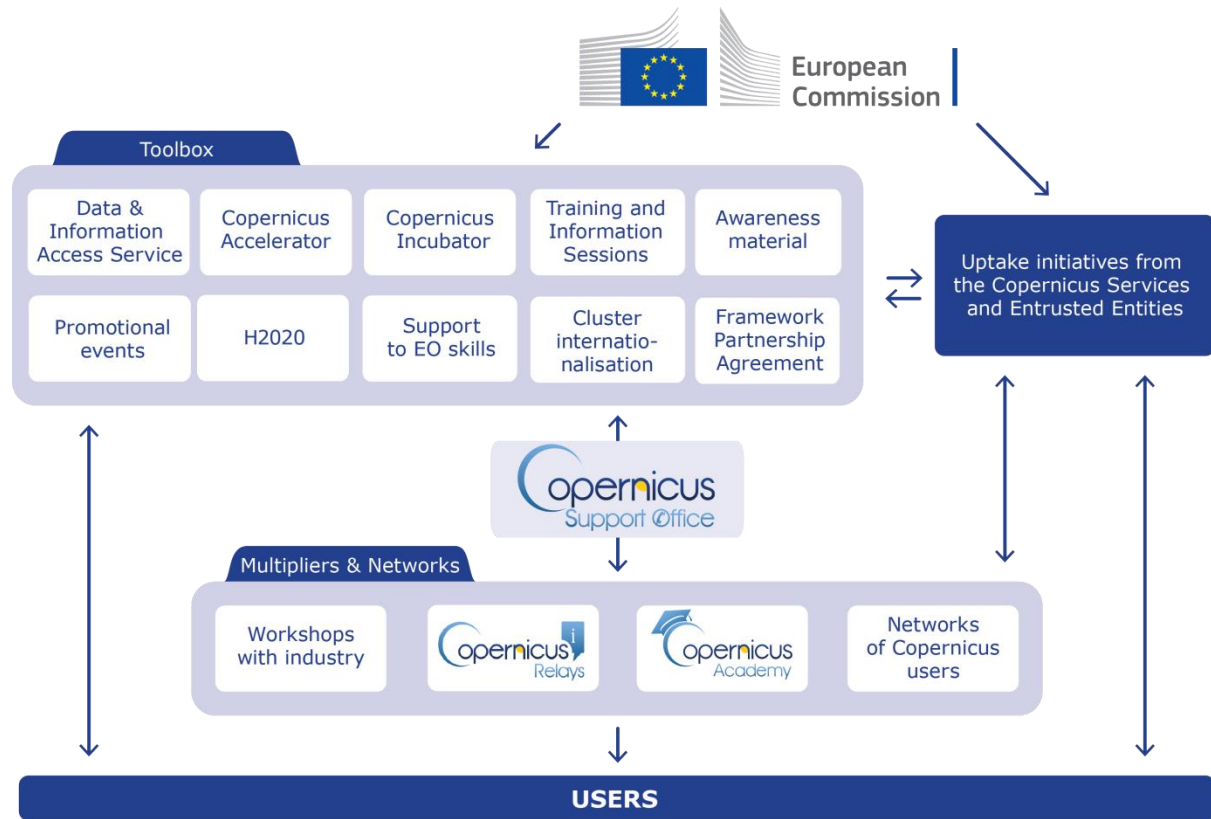
II) Facilitate **access** to Copernicus

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Leverage with actions from Member States and Entrusted Entities

User Uptake

European Commission

Toolbox

Data & Information Access Service	Copernicus Accelerator	Copernicus Incubator	Training and Information Sessions	Awareness material
Promotional events	H2020	Support to EO skills	Cluster internationalisation	Framework Partnership Agreement

Uptake initiatives from the Copernicus Services and Entrusted Entities

Copernicus Support Office

Multipliers & Networks

Workshops with industry	Copernicus Relays	Copernicus Academy	Networks of Copernicus users

USERS

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Copernicus Europe's eyes on Earth

European Commission

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
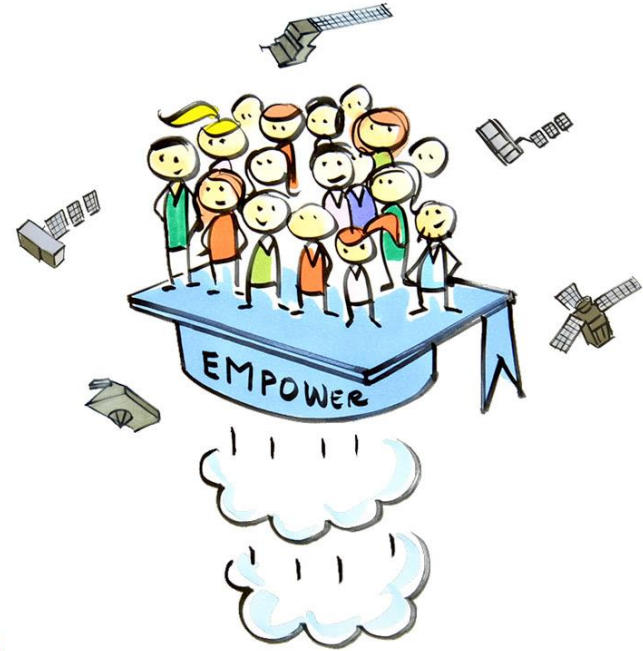- Organising promotional events and training

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

EMPOWER

Copernicus Academy

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

Copernicus Relays in Slovakia
Insar.sk – Matus Bakon

Copernicus Academy in Slovakia

Pavol Jozef Safarik University in Kosice – Michal Gallay

**User
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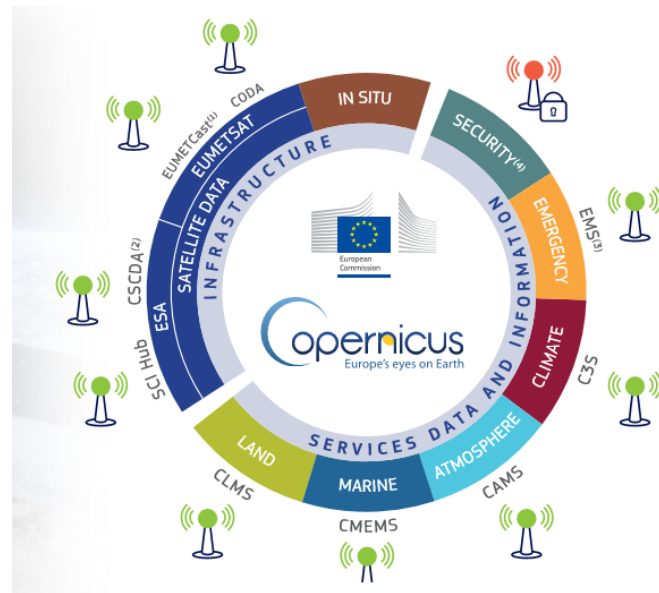
User
Uptake

- **Enhanced distribution (Open hub)**

- **Data and Information Access Services (DIAS)**
  operational from June 2018

- **Copernicus Support Office**
  - 2000+ ticket handled
  - replies within few hours
  - animates Relays and Academy networks

Data Access

- **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.*

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Data Access

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**

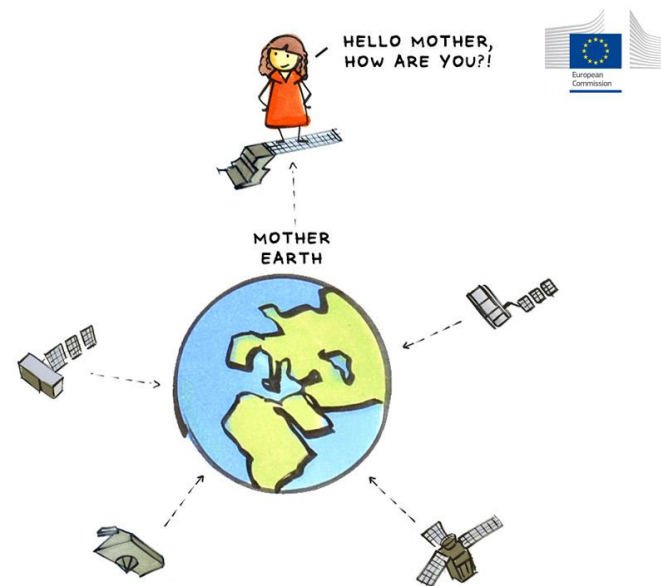**Overall ensuring that Copernicus data is easily accessible and used!**

Copernicus Support Office

✉ support@copernicus.eu

Ask on Twitter
@CopernicusEU

HELLO MOTHER, HOW ARE YOU?!

MOTHER EARTH

Questions about Copernicus?
Ask the Copernicus Support Office team!

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

User Uptake

I) Increase **awareness** about Copernicus

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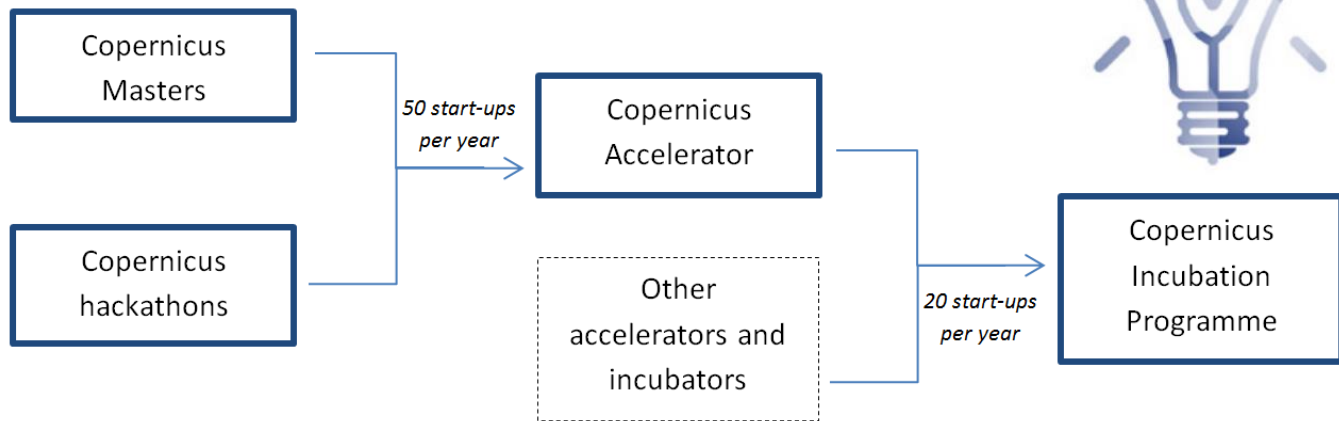**Leverage with actions from Member States and Entrusted Entities**

User Uptake

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

Copernicus start-up programme

| Copernicus Masters | | Copernicus Accelerator | | Copernicus Incubation Programme |

50 start-ups per year

Copernicus hackathons

Other accelerators and incubators

20 start-ups per year

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…);

- **Register now at copernicus-masters.com**

User Uptake

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;

- **Apply before 9 July!**

User Uptake

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.

- Stay tuned! Copernicus-masters.com/accelerator

User Uptake

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

Copernicus

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 3 months we have included **2+ billion new potential users to Copernicus!**
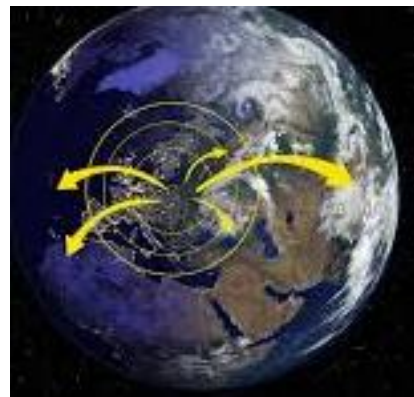
- **Stability of the programme and long-term commitment:**

  – (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 CO_2 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

Thank you!

For questions email me at:
stefano.la-terra-bella@ec.europa.eu

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Copernicus EU   www.copernicus.eu

Space