

Copernicus and EO @ European Commission's Joint Research Center (JRC)

presented by P. Strobl (JRC)

EODC Forum 2024

10 June 2024



Copernicus

EU SPACE PROGRAMME OVERVIEW



COPERNICUS

Earth Observation (EO) and monitoring based on satellite and non-space data

Nr.1 world provider of space data and information



GALILEO

Global satellite navigation and positioning system (GNSS)

10% of the EU GDP enabled by satellite navigation



EGNOS

Reliable navigation signals for safety of life use

Operational in 360+ airports & helipads in 23 countries



SSA

Space situational awareness monitoring and protecting space assets

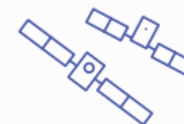
Providing surveillance and tracking services to 210+ satellites



GOVSATCOM

Secure satellite communications for EU security actors

Delivering rapid support over crisis areas



Competitive edge

Completing current satellite constellations, developing and launching the next-generation of satellites



Research innovation

Ambitious research and innovation programme benefiting from Horizon Europe



Fighting Climate Change

Monitoring biodiversity, environmental compliance and CO2 emissions (Paris Agreement)



EU as a global actor

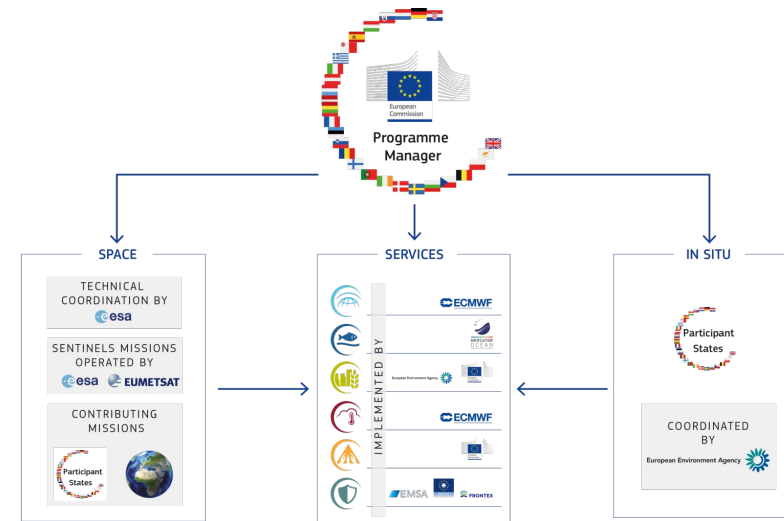
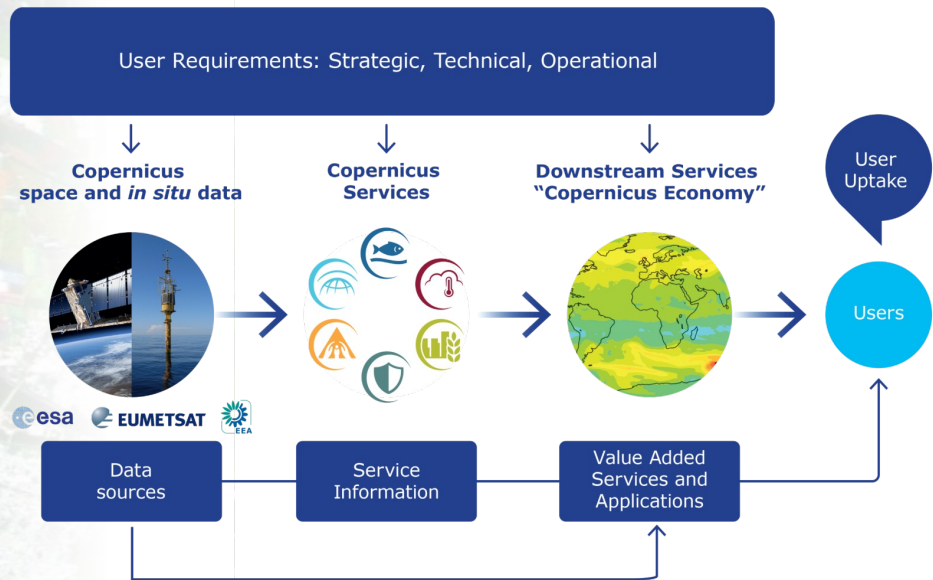
Supporting disaster relief, humanitarian assistance and security operations



Cop

Copernicus

- **Copernicus, the Earth Observation and Monitoring flagship programme** of the European Union
- **Monitors the Earth**, its environment and ecosystems
- **Full, free and open data policy**
- **Operational** and long term **Sustainability**
- Coordination by **European Commission DG DEFIS** & implemented by **Delegated Entities**



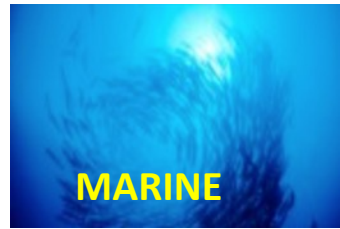
Copernicus structure



Sentinels



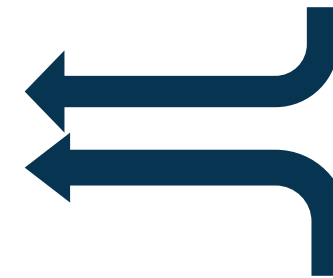
Six services using Earth Observation data to deliver timely and reliable information



Value-added Services



Contributing missions



In situ data

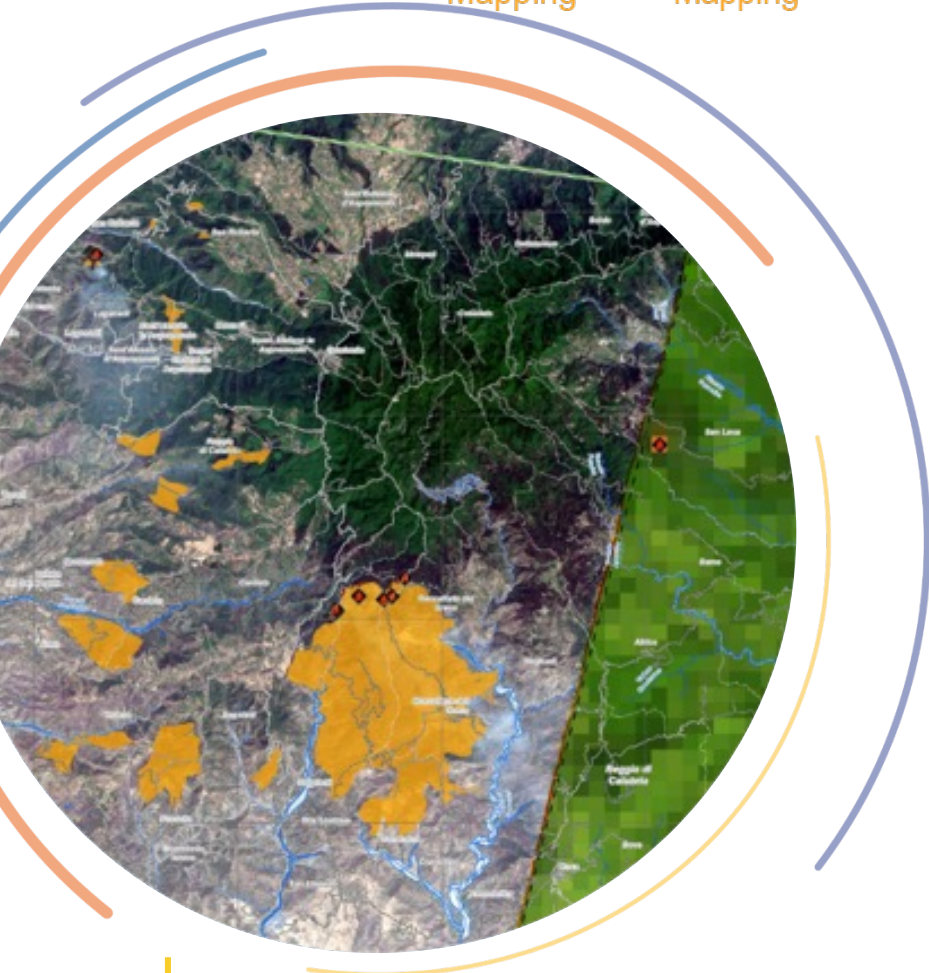
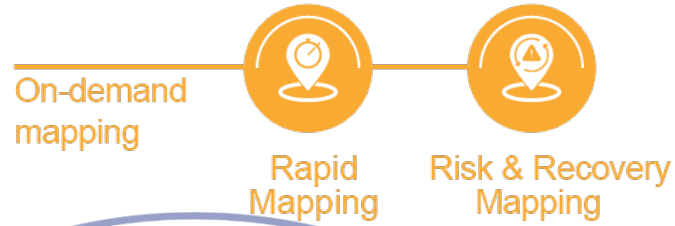


Open and free data policy
User driven

JRC's Copernicus and EO related activities

- Entrusted Entity for the implementation of two services:
 - Copernicus Emergency Management Service (CEMS)
 - Copernicus Land Monitoring service (CLMS) together with EEA
- Facilitator of the implementation of the new Common Agricultural Policy (CAP)
- Operation of its in-house Big Data Platform (BDAP)
- Support to the EU Data Strategy and Data Spaces including the Copernicus Data Space Ecosystem (CDSE)

THE COPERNICUS EMERGENCY MANAGEMENT SERVICE



- Supporting all actors in **managing natural and man-made disasters**
- Covers **all phases of risk management** from prevention to preparedness to recovery
- operational since **12 years**
- Managed by the **Joint Research Center**
- Combining Earth Observation with in-situ data and models to **provide timely and accurate geospatial information and products** to its users



CEMS Innovation: the Global Flood Monitoring product

- Unique product providing a **continuous global & systematic monitoring of floods** thanks to Sentinel-1 SAR imagery which enables all day and all-weather flood monitoring
- Significantly enhances the **timeliness**: less than 8 hours between sensing and product delivery
- Generation of Sentinel 1 based **archive of flood events** from 1 January 2015 until recent



**CEMS GFM Flood extent
on 11 May 2024 for Rio
Grande do Sul, Porto
Alegre, Brazil**

2024-05-1108:49:43Z

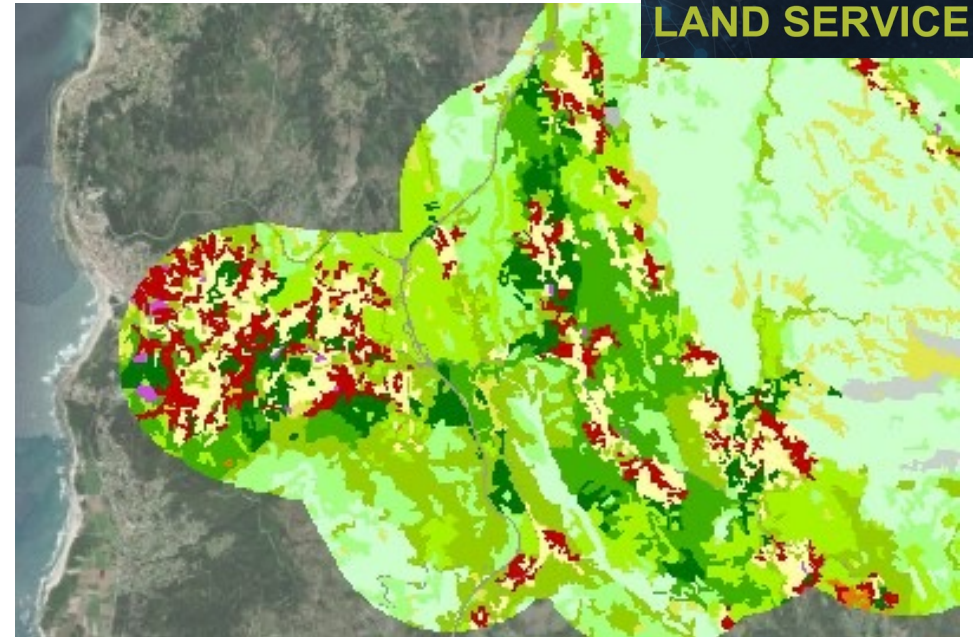
- Operated by **EODC-led consortium**
- **Continuous evolution** through improved algorithms & integration of user feedback

The Copernicus Global Land Monitoring Service CLMS

CLMS provides vegetation indices, phenology and land cover to monitor land ecosystems

CLMS and CMEMS provide water quality data for inland and marine waters (EU Water Framework Directive, Bathing Water Directive, Marine Strategy Framework Directive)

CLMS is entrusted to EEA (European component) and JRC (global component)



Global Land component

- Biophysical Variables systematic monitoring
- Land Cover and Forest Mapping and Monitoring
- Ground Based Observations for Validation
- Hot Spot Monitoring - Biodiversity and Agriculture
- Sentinel-2 Global Mosaics



IMPLEMENTATION

Land Cover and Forest mapping and Monitoring (LCFM)

 <p>Land Cover Characteristics</p> <p>Sub-annual 10m 2020-2026 Per pixel based feature extractions</p>	 <p>Land Surface Categories</p> <p>Sub-annual 10m 2020-2026 Categories of direct observable surface properties</p>	 <p>Land Cover Map</p> <p>Annual 10m 2020-2026 Land cover map minimum of 11 land cover classes</p>	 <p>Land Cover Change Map</p> <p>Annual 10m 2021-2026 Annual land cover changes</p>	 <p>Land Cover Map</p> <p>Annual 100m 2020-2026 Land cover map, cover fraction layers</p>	 <p>Land Cover Change Map</p> <p>Annual 100m 2021-2026 Annual land cover changes</p>	 <p>Land Cover Characteristics</p> <p>Annual 10m 2020-2026 Per pixel based yearly statistics</p>
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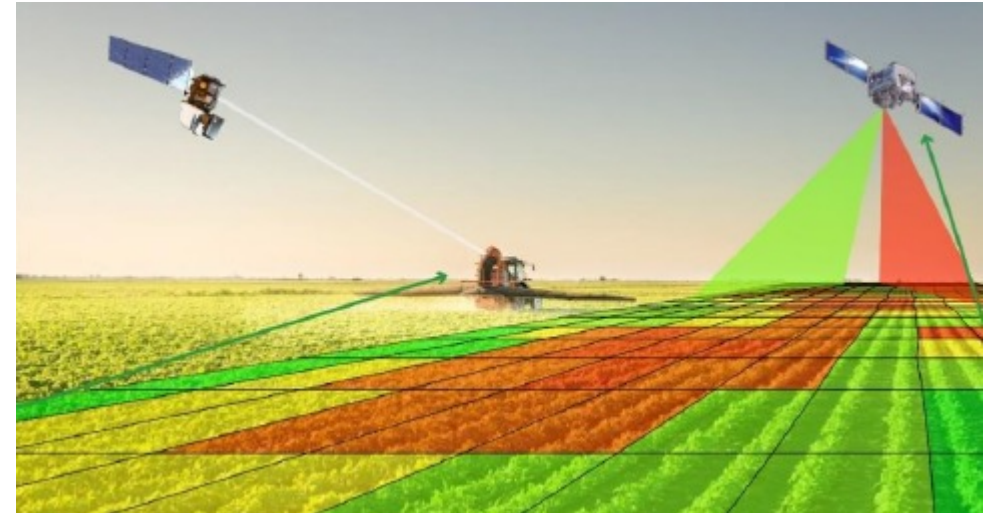
- Ramp up phase in 2024 processing 10% of the globe
- Technical meetings on definition of test areas, class definitions, Land Surface Categories

➤ **Massive increase of S2 use at global scale in CLMS!**

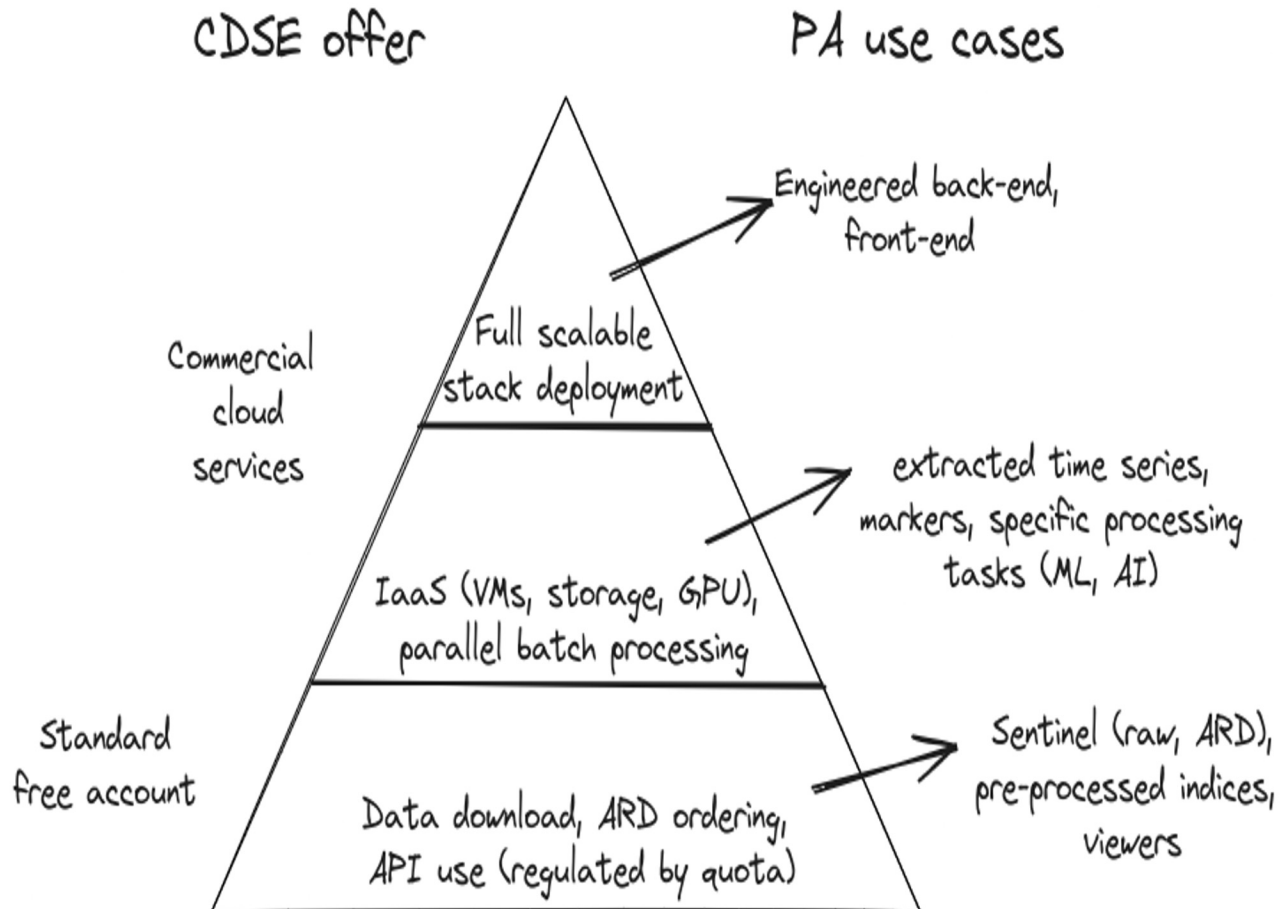
From ‘Farm to Fork’: designing a fair, healthy and environmentally-friendly food system

The use of Copernicus images becomes mandatory for the implementation and monitoring of national Strategic Plans as of 2023 (CAP – Common Agriculture Policy)

Copernicus data are very relevant for “smart farming” applications like precision agriculture

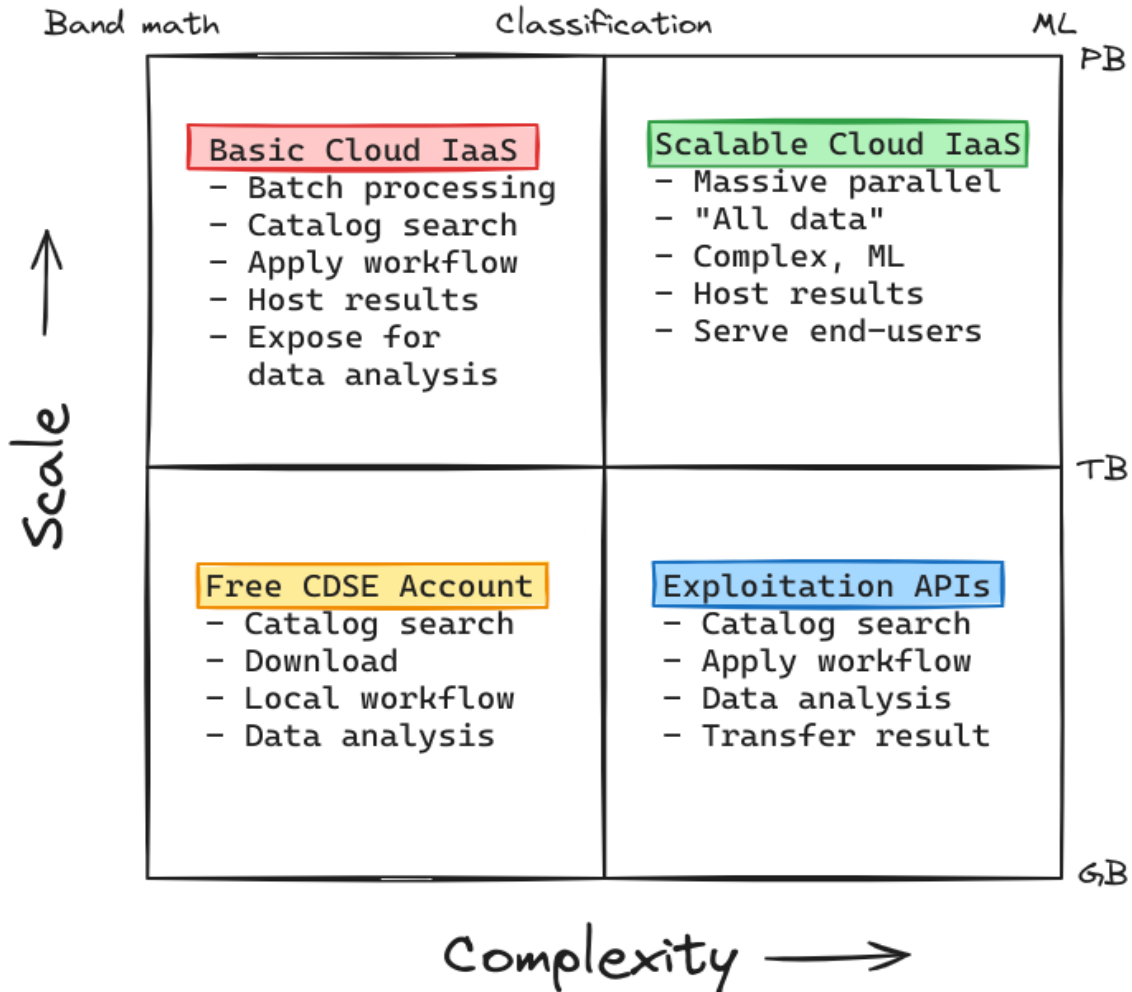


Copernicus in the Common Agriculture Policy (CAP)



- Exploiting the full potential of EO for monitoring agriculture
- CDSE use for CAP Paying Agencies (PA) is sponsored with DG AGRI funding
- <https://dataspace.copernicus.eu/ecosystem/services/cap-area-monitoring-services>

JRC support to CDSE onboarding of CAP users

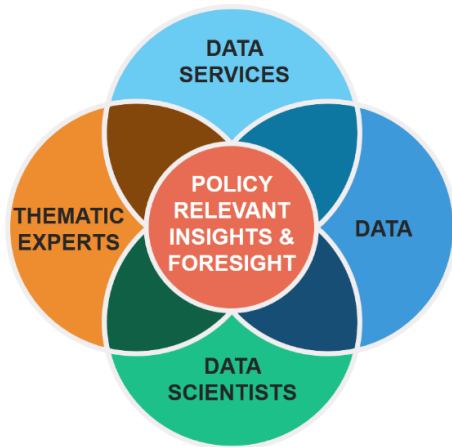


- Extends from basic use to full stack deployment of engineered solutions
- Includes credits for cloud IaaS/SaaS/PaaS and SentinelHub, OpenEO API use
- Currently 7 Paying Agencies onboarded
- relevant demos (including AI, GPU use)
- Challenges:
 - ❖ Technology hurdle (lack of cloud expertise)
 - ❖ Suboptimal ARD situation, esp. for SAR

JRC Big Data Analytics Platform (BDAP)



BDAP is an on-premises cloud platform that provides data, data analytics environments, and software to JRC researchers, all in a single place.



BDAP links data, data services, data scientists, and thematic experts for generating policy relevant insights and foresight.

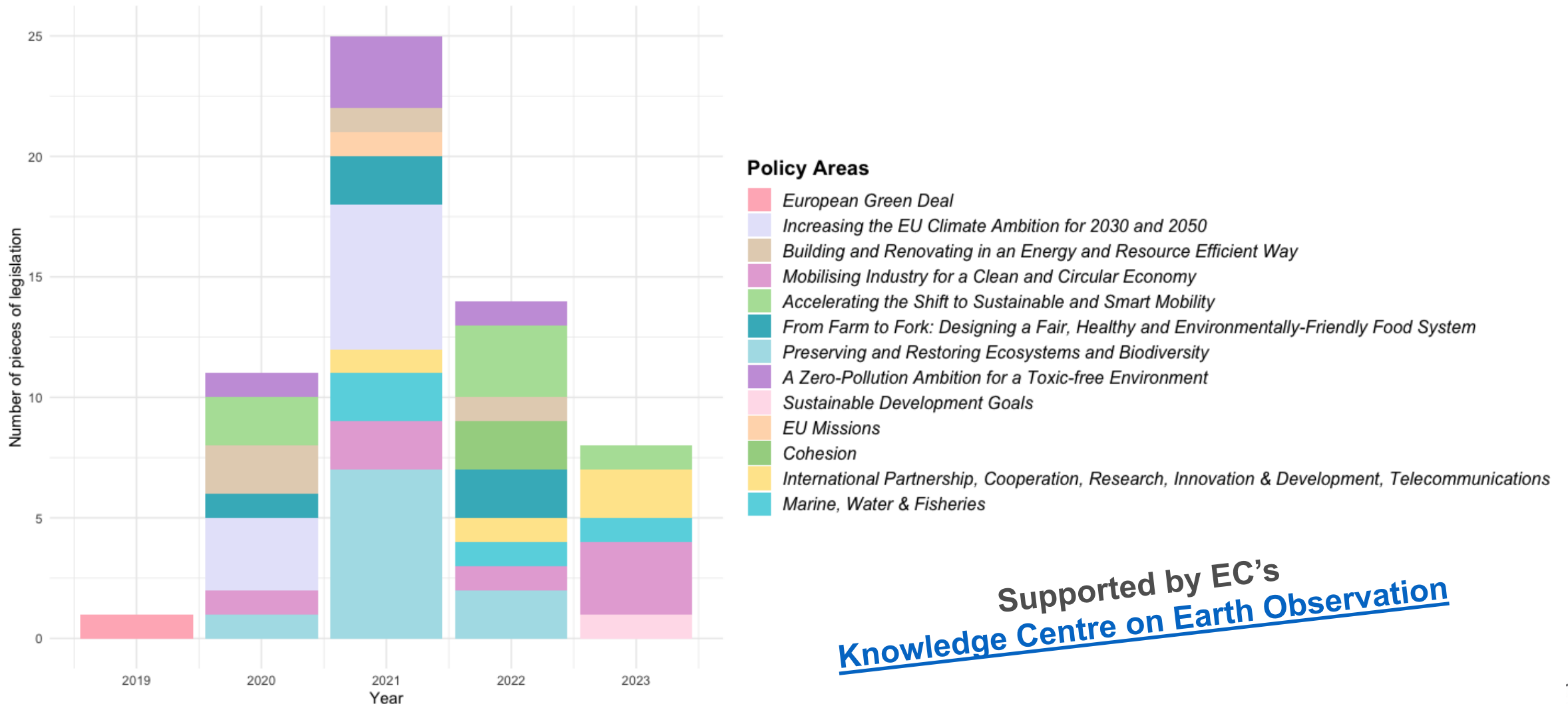
BDAP SOFTWARE LANDSCAPE

Operating systems & virtualisation	Data science languages & IDEs	AI & Machine Learning
Storage & file sharing	Monitoring & Automation	HTC/HPC & Workflow engine
Web-desktop for data science	Search engine & web server	Databases & Catalogs
		Geospatial software applications

HOME PAGE: <https://jeodpp.jrc.ec.europa.eu>

Green Deal policies referring to Copernicus

European Green Deal Legislation including Copernicus by policy area over time



Supported by EC's
Knowledge Centre on Earth Observation

New policy context

European Strategy for Data

Goal:

Create a **European Single Market for Data**.

Problems to be addressed:

Data availability, interoperability, quality.

Governance & infrastructures.

Skills & data literacy.

Cybersecurity.

Envisages the establishment of:

A **Common European Data Space**.

Sectoral Data Spaces.



<https://digital-strategy.ec.europa.eu/en/policies/strategy-data>

Implementing Act on High-Value Datasets

Annex

Annex – HVDs categories



Definition.

Datasets in scope.

Requirements:

Granularity.

Geospatial coverage.

Key attributes.

Specific arrangements.

1. GEOSPATIAL

1.1. Datasets in scope

The geospatial thematic category includes datasets within the scope of the INSPIRE data themes Administrative units, Geographical names, Addresses, Buildings and Cadastral parcels as defined in Annex I and Annex III to Directive 2007/2/EC of the European Parliament and of the Council ^(*). In addition, it includes Reference parcels and Agricultural parcels as defined in Regulation (EU) No 1306/2013 of the European Parliament and of the Council ^(*) and of Regulation (EU) No 1307/2013 of the European Parliament and of the Council ^(*) and the related delegated and implementing acts ^(*). Their granularity, geographical coverage and the key attributes are listed in the table below. If datasets are not available at the scale indicated in the table below, but are available at higher spatial resolution(s) ^(*), they shall be provided at the available spatial resolution.

Datasets	Administrative units	Geographical names	Addresses	Buildings	Cadastral parcels	Reference parcels	Agricultural parcels
Granularity	All levels of generalisation available with a granularity up to the scale of 1:5 000. From municipalities to countries; maritime units.	N/A	N/A	All levels of generalisation available with a granularity up to the scale of 1:5 000.	All levels of generalisation available with a granularity up to the scale of 1:5 000.	A level of accuracy that is at least equivalent to that of cartography at a scale of 1:10 000 and, as from 2016, at a scale of 1:5 000, as referred to in Article 70(1) of Regulation (EU) 1306/2013.	A level of accuracy that is at least equivalent to that of cartography at a scale of 1:10 000 and, as from 2016, at a scale of 1:5 000, as referred to in Article 70(1) of Regulation (EU) 1306/2013.
Geographical coverage	Single or multiple datasets that shall cover the entire Member State when combined.						

^(*) Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) (OJ L 108, 25.4.2007, p. 1).

Shaping European Data Spaces

Research on data sharing

JRC Science for Policy Report:

EU Data Spaces - Scientific insights into data sharing and utilisation at scale

<https://publications.jrc.ec.europa.eu/repository/handle/JRC129900>

Easy entry point to data spaces knowledge base.

Ingredients: Findings from JRC articles, reports on data sharing.

Mapped to technical and non-technical requirements for data spaces (EU Strategy for Data (2020) + SWD(2022) 45 final).

Products:

Living document (wiki):

<https://wikis.ec.europa.eu/display/jrcdataspaceswiki/>

Interactive component (chatbot, Q&A system).

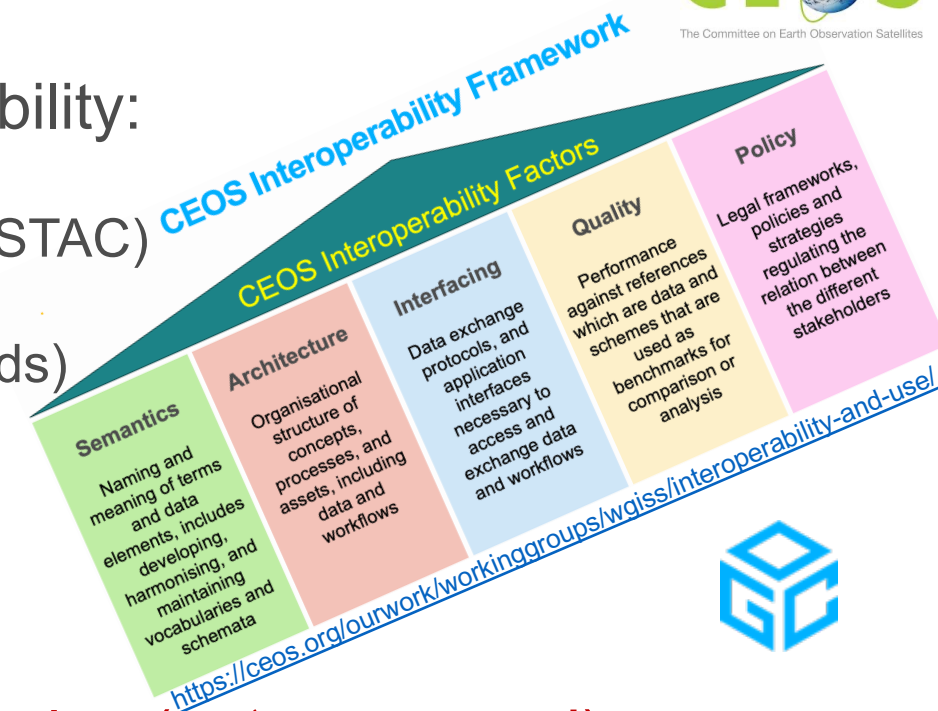
Contributes to the work of the Data Spaces Support Centre and the European Innovation Board.



Co-created and validated by different services (ENV, SANTE, GROW, DIGIT, JRC, AGRI, CNECT).

Opportunities for joint actions

- ❑ Enhanced cooperation of all European EO Data clouds fostering data and resource sharing, and complementarity
- ❑ Improvement of standards for better interoperability:
 - ❑ Data and metadata content and formats (e.g. ARD, STAC)
 - ❑ Data representation and encoding (e.g. grids, legends)
 - ❑ User Interfaces and APIs (e.g. openEO, Pangeo)
 - ❑ Authentication and authenticity



➤ working towards a full-fledged geospatial federation (or 'ecosystem')

Thank you

... and Happy Birthday EODC !!!

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