



PROGRAMME OF
THE EUROPEAN UNION



#EUSpace

COPERNICUS: EUROPE'S EYES ON EARTH

Copernicus is the Earth Observation component of the European Union's Space Programme, which monitors our planet and its environment for the ultimate benefit of the citizens of Europe. It delivers data, information and services based on satellite Earth Observation data and in situ (non-space) data. Copernicus is funded, coordinated and managed by the European Commission in cooperation with partners such as ESA and EUMETSAT.

The Copernicus component of the EU Space Programme is served by a set of **dedicated satellites** (the Sentinel family) and **contributing missions** (existing commercial and public satellites). The Sentinel satellites are specifically designed to meet the needs of the Copernicus information services and their users. Since the launch of Sentinel-1A in 2014, the European Union has initiated a process to place a complete constellation of almost **20 satellites** in orbit before 2030. Today, there are eight Sentinel satellites in orbit, of five different types. Copernicus satellites, along with ground-based, airborne and seaborne measurement sensors, are providing vast amounts of global data.

The Copernicus services transform the wealth of satellite and in situ data into timely and actionable information by processing and analysing it. The services deliver datasets and time series that are comparable and searchable, ensuring that trends and changes are monitored. Patterns are examined and used to create better forecasts of, for example, the ocean and the atmosphere. Maps are derived from imagery, features and anomalies are identified and statistical information is extracted. These value-adding activities are streamlined through **six thematic streams** of Copernicus services:

- the Copernicus Atmosphere Monitoring Service (CAMS)
- the Copernicus Marine Environment Monitoring Service (CMEMS)
- the Copernicus Land Monitoring Service (CLMS)
- the Copernicus Climate Change Service (C3S)
- the Copernicus Emergency Management Service (CEMS)
- the Copernicus Security Service

The vast majority of the information services, as well as the data from which they are derived, are accessible on a **free, full and open basis** by anyone. This data and information are used by service providers, public authorities and international organisations to improve the quality of life for citizens of Europe and around the world, to monitor and mitigate climate change, and to preserve our fragile environment.





ATMOSPHERE MONITORING SERVICE – CAMS

IMPLEMENTED BY
ECMWF

The Copernicus Atmosphere Monitoring Service (CAMS) provides continuous data and information on atmospheric composition by monitoring and forecasting constituents such as greenhouse gases, reactive gases, ozone and aerosols. CAMS delivers consistent and quality-controlled information useful to develop applications for air pollution, health, solar energy, greenhouse gases and climate change-related topics to help policymakers, businesses and citizens address environmental concerns.

- More information on <https://atmosphere.copernicus.eu/>



MARINE ENVIRONMENT MONITORING SERVICE - CMEMS

IMPLEMENTED BY
MERCATOR OCEAN

The Copernicus Marine Environment Monitoring Service (CMEMS) provides regular and systematic reference information on the physical and biogeochemical state, variability and dynamics of the ocean and marine ecosystems for the global ocean and the European regional seas. The observations and forecasts produced by the service support all marine applications, including:

- Coastal and marine environment
- Sustainable use and conservation of marine resources
- Weather, seasonal forecasting and climate
- Marine safety

CMEMS supports the implementation of EU policies such as the Green Deal by supporting resilience to climate change, sustainable management of marine resources and development of the blue economy with green industries. CMEMS delivers monthly ocean monitoring indicators and an annual Ocean State Report describing the main trends in terms of climate change for the oceans.

- More information on <http://marine.copernicus.eu/>



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|----------------------------------|-----------------------|
| 1 SEA ICE MONITORING | 6 COSTAL MONITORING |
| 2 MARINE CONSERVATION & POLICIES | 7 SOCIETY & EDUCATION |
| 3 SCIENCE & CLIMATE | 8 MARINE FOOD |
| 4 NATURAL RESSOURCES & ENERGY | 9 MARINE NAVIGATION |
| 5 WATER QUALITY | 10 SAFETY DISASTER |

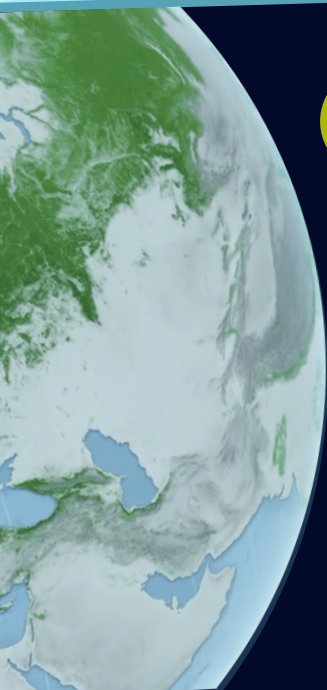


LAND MONITORING SERVICE – CLMS

IMPLEMENTED BY
European Environment Agency
JRC

The Copernicus Land Monitoring Service (CLMS) provides geospatial information on land cover and its changes, land use, vegetation and agriculture state, water cycle, cryosphere and incoming solar radiation, to a broad range of users in Europe and across the World for environmental applications. The service is based on Earth Observation data combined and modelled with data from other sources. It supports environmental and development policies, as well as applications in domains such as spatial and urban planning, forest management, water management, agriculture and food security, nature protection and restoration, rural development, ecosystem accounting and mitigation/adaptation to climate change.

- More information on <https://land.copernicus.eu/>





CLIMATE CHANGE SERVICE – C3S

IMPLEMENTED BY
 ECMWF

The Copernicus Climate Change Service (C3S) supports the European Union's efforts towards a climate smart society by providing consistent and authoritative information about the past, present and future climate in Europe and in the rest of the world. C3S provides free and open access to state-of-the-art quality-assured climate information, relevant to European Union sectoral policies. It delivers climate data records to monitor major climate drivers and document climate change fingerprints (e.g. surface air temperature) as well as climate predictions and projections for relevant variable, alongside the tools required to transform this data into actionable insights.

- More information on <https://climate.copernicus.eu/>



EMERGENCY MANAGEMENT SERVICE – CEMS

IMPLEMENTED BY
 JRC

Natural disasters affect thousands of people every year in the world. The Copernicus Emergency Management Service (CEMS) supports all actors involved in the management of disasters caused by meteorological or geophysical phenomena, or man-made by providing geospatial information to inform decision making.

CEMS constantly monitors Europe to forecast, analyse, and provide information for resilience strategies. For events for which forecasts can be produced, such as floods or forest fires, the service provides early warnings and notifications to its users. CEMS can be activated on-demand and offers to provide them with maps, time series or other relevant information to better manage disaster risk. CEMS maps assist the organisation of the safe evacuation and sheltering of people affected by disasters such as earthquakes, volcanic eruptions, floods and forest fires. CEMS products can also be used to monitor recovery and reconstruction after a disaster has occurred.

- More information on <http://emergency.copernicus.eu/>



SECURITY SERVICE

IMPLEMENTED BY
 FRONTEX
 EMSA
 SatCen

The Copernicus Security Service applications aim to support European Union policies by providing information in response to Europe's security challenges. The applications focus on three key areas:

- Copernicus Maritime Surveillance** provides satellite image products for monitoring activities at sea by European maritime authorities.
- Copernicus Border Surveillance Service** improves the situational awareness at the EU's external borders, contributing to saving lives at sea and tackling cross-border crime.
- Copernicus Service in Support to European external actions** provides geospatial intelligence in support of global EU security commitments, such as crisis mitigation and risk assessment.

- More information on <https://www.copernicus.eu/en/services/security>

→ SPACE COMPONENT

IMPLEMENTED BY
 ESA
 European Environment Agency
 EUMETSAT

Planned and Ordered

SENTINEL-4
Atmospheric Chemistry sensor

SENTINEL-5
Atmospheric Chemistry sensor

- EXPANSION MISSIONS**
- Hyperspectral Imaging Mission
 - Imaging Microwave Radiometer
 - Anthropogenic Carbon Dioxide Monitoring
 - Polar Ice and Snow Topography Altimeter
 - Land Surface Temperature Monitoring
 - L-Band Synthetic Aperture Radar

Current

SENTINEL-1A
Synthetic Aperture radar

SENTINEL-1B
Synthetic Aperture radar

SENTINEL-2A
Multi-spectral optical sensor

SENTINEL-2B
Multi-spectral optical sensor

SENTINEL-3A
Medium resolution optical sensor and Altimeter

SENTINEL-3B
Medium resolution optical sensor and Altimeter

SENTINEL-5P
Atmospheric Chemistry sensor

SENTINEL-6
Radar Altimeter

The Copernicus Sentinel satellites are the dedicated Earth Observation satellites. They ensure an independent and autonomous Earth Observation capacity for Europe. The Sentinel types cover a broad range of Copernicus observation needs, ranging from day-and-night all-weather observations to land and ocean surfaces, sea-surface topography, and air quality, measuring trace gases in the atmosphere. In addition to these dedicated satellites, Copernicus is making use of satellite data from contributing missions, either from private companies or from institutional partners through dedicated agreements.

- More information on <https://spacedata.copernicus.eu/>

The **Copernicus component** of the EU Space Programme provides **accurate, high-quality data and information**. It also relies on in situ observations from ground, sea, and air-borne sensors, as well as geospatial ancillary or reference data, for calibrating, validating and complementing satellite products. The in situ component is responsible for identifying data access gaps and bottlenecks, supporting the provision of cross-cutting data, managing partnerships with data providers to improve access and use conditions, and brokering innovative solutions with services, providers or national authorities.

More information on <https://insitu.copernicus.eu/>

DATA ACCESS

Copernicus data and information is available under a **free, full and open data policy**. Data from the Copernicus Sentinel satellites are accessible for download through dedicated infrastructures operated by the **European Space Agency (ESA)** and **EUMETSAT**. In addition to the data-hubs, EUMETCast broadcasts some Sentinel data directly to the users' desk. Copernicus services information is made available through dedicated websites. For users who do not wish to transfer data to their own systems, Copernicus data and information are available through the data access facilities (Data and Information Access Services) allowing users to process and analyse them in the cloud.

More information on <https://www.copernicus.eu/en/access-data>

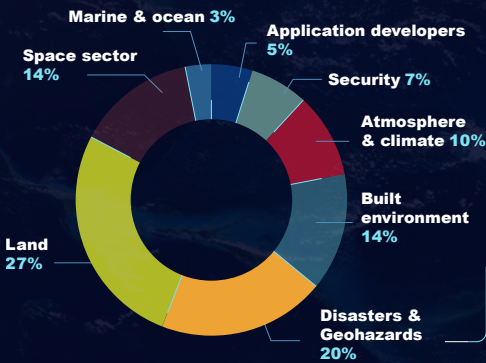
The Copernicus ecosystem:
Rapidly growing user uptake

500,000
users of Copernicus data and services products

SOCIO ECONOMIC BENEFITS

Copernicus helps us address **key societal challenges** of our times, such as climate change, natural disasters or border control. It also creates endless business opportunities.

Past studies have estimated that, between 2017 and 2035, Copernicus would generate between **€67 and €131 billion** in benefits for the European society and economy. This is ten to twenty times the cost of the Copernicus component of the EU Space Programme. Interestingly, **more than 80%** of the benefits are expected to be generated outside of the space sector, through the use of Copernicus data in other parts of the economy (agriculture, fisheries, insurance, air quality etc.). As demonstrated by the EUSPA EO and GNSS Market Report for 2022, the Earth Observation market is growing at a steady pace and Copernicus open data is a key driver of growth in this area.



USER UPTAKE ACTIVITIES

The European Commission has developed actions to **support users** of Copernicus and maximise the benefits of the component. Almost **three hundred Copernicus Relays** and **Copernicus Academy members** in all European regions and beyond act as local ambassadors and support a myriad of awareness events every year. Copernicus information sessions and webinars are organised regularly to offer networking and engagement opportunities for all members, including an annual General Assembly. Dedicated training and course materials have also been developed in the context of the Copernicus Skills programme. Copernicus now has over **500,000 users**, largely exceeding original expectations.

INTERNATIONAL COOPERATION

During its term as Chair of the Committee on Earth Observation (CEOS), the European Commission with Copernicus laid the foundations for an **international carbon and Greenhouse gas monitoring system** in support of the Paris Climate Agreement, which is now being implemented. Cooperation Arrangements with third countries provide additional value to the European Union in a reciprocal manner (e.g. access to satellite data and in situ data, cooperation on data processing, data assimilation into models and products of the Copernicus services). It creates enabling conditions for European industry and service providers in the partner country markets to foster the uptake of European-developed services and products.

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