The Copernicus Marine Service (CMEMS) State of Play

Pierre-Yves Le Traon, Mercator Ocean International

Copernicus Land, Marine, & Coastal Workshop
March 30, 2021

Marine Monitoring

OUTLINE

1. The Copernicus Marine Service as of today
2. User engagement and user uptake
3. Service Evolution
4. Upstream observation infrastructure
5. The Copernicus Marine Service and Coastal Zone users

Marine Monitoring

The Copernicus Marine Service as of today

The Copernicus Marine Service is in its 6th year of operations

Marine Monitoring

2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | | | | | 2028

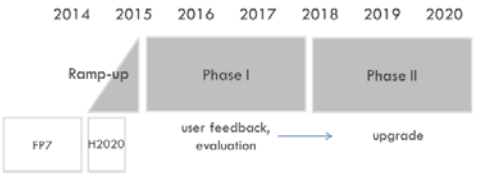
Copernicus 1 operational : April 2015 - June 2021

Copernicus 2

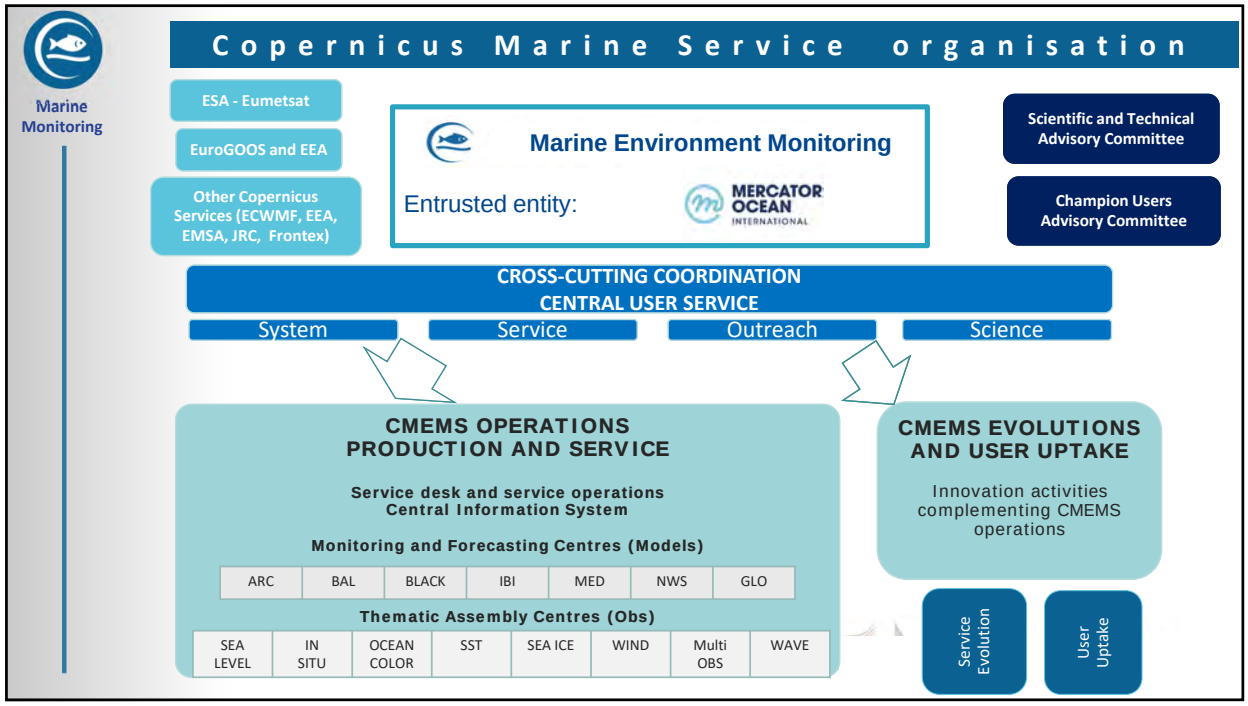
1st year of operations | 2nd year of operations | 3rd year of operations | 4th year of operations | 5th year of operations | 6th year of operations

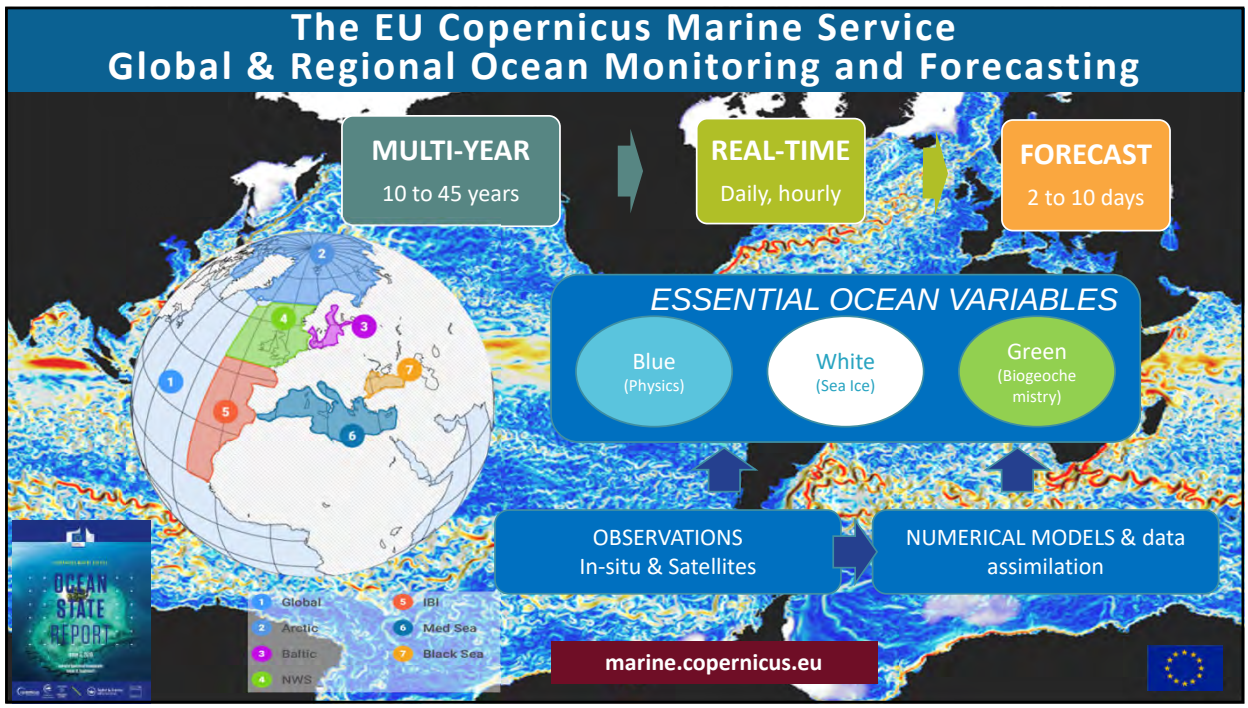
CMEMS operations

Phase 1 | Phase 2



CMEMS has been doing very well. Very good KPI in service availability, product quality and user satisfaction, a constant growth in user uptake, and regular updates of the service offer.


Marine Monitoring
Copernicus Marine Service organisation
ESA - Eumetsat
EuroGOOS and EEA
Other Copernicus Services (ECWMF, EEA, EMSA, JRC, Frontex)
Marine Environment Monitoring
Entrusted entity:
MERCATOR OCEAN INTERNATIONAL
Scientific and Technical Advisory Committee
Champion Users Advisory Committee
CROSS-CUTTING COORDINATION
CENTRAL USER SERVICE
System
Service
Outreach
Science
CMEMS OPERATIONS PRODUCTION AND SERVICE
Service desk and service operations
Central Information System
Monitoring and Forecasting Centres (Models)
ARC
BAL
BLACK
IBI
MED
NWS
GLO
Thematic Assembly Centres (Obs)
SEA LEVEL
IN SITU
OCEAN COLOR
SST
SEA ICE
WIND
Multi OBS
WAVE
CMEMS EVOLUTIONS AND USER UPTAKE
Innovation activities complementing CMEMS operations
Service Evolution
User Uptake


The EU Copernicus Marine Service
Global & Regional Ocean Monitoring and Forecasting
MULTI-YEAR
10 to 45 years
REAL-TIME
Daily, hourly
FORECAST
2 to 10 days
ESSENTIAL OCEAN VARIABLES
Blue
(Physics)
White
(Sea Ice)
Green
(Biogeochemistry)
OBSERVATIONS
In-situ & Satellites
NUMERICAL MODELS & data assimilation
OCEAN STATE REPORT
1 Global
2 Arctic
3 Baltic
4 NWS
5 IBI
6 Med Sea
7 Black Sea
marine.copernicus.eu

Marine Monitoring

Copernicus Marine Service Ocean State Reports

Scientific knowledge & expertise

+

Data Products

IN SITU

SATELLITE

MODEL

Ocean State Report

Summary for policy makers

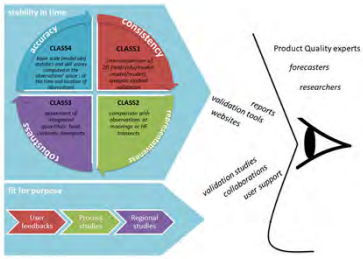
Ocean Monitoring Indicator framework

Marine Monitoring

Service Offer

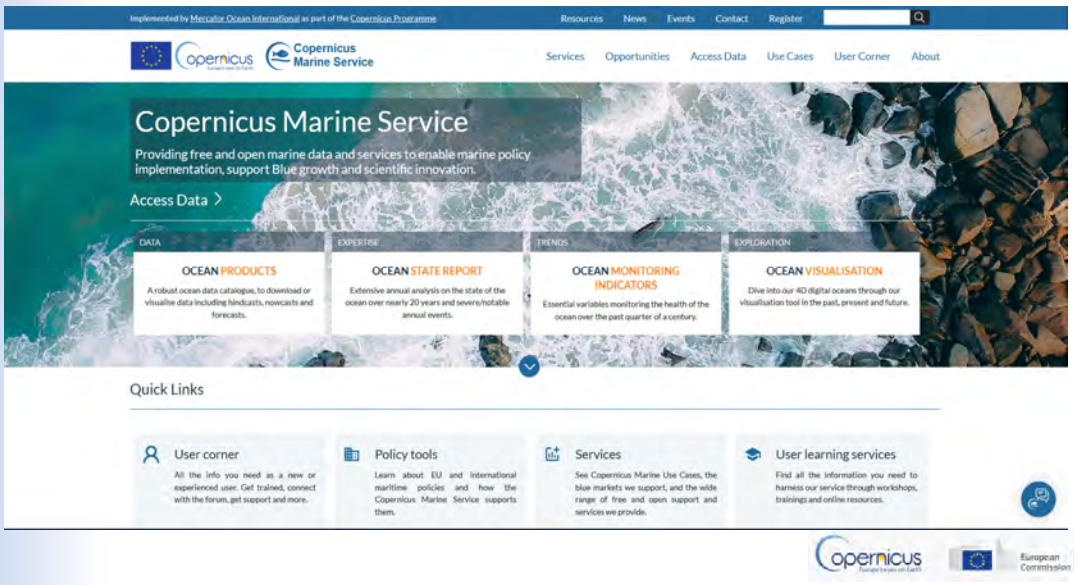
- **Access to products**: A cloud based infrastructure and a central information system to search, view, download about 200 products from the catalogue or through scripts
- **Description of each product - PUM**
- **Information on quality/validation of products – QUID**
- **Service desk / expert advice**

https://pqd.mercator-ocean.fr/



Marine Monitoring

https://marine.copernicus.eu/



Marine Monitoring

CONTINUOUS EVOLUTION OF THE OFFER

As initially planned:

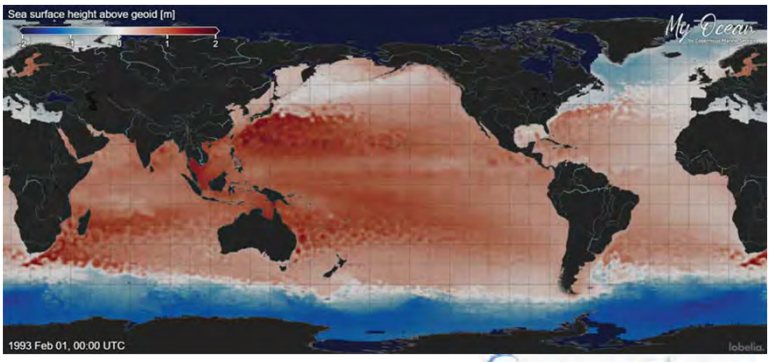
- Progressive adding of products and marine parameters (such as waves, acidity, CO2, iceberg density…) to reach the full fledge portfolio
- Higher spatial and temporal resolution
- Higher scientific quality and reduced uncertainty
- Longer forecast, longer time series
- More satellite data (Sentinels) used as upstream input
- New format, new visualisation tools

Marine Monitoring

New visualisation tool

https://cmems.lobelia.earth

- Easy to use
- available on all computers and mobile devices through any internet browser.
- brings you high-quality information free of charge and is ad-free as well.
- You do not need to be a registered user to access it.
- Download images
- Export videos
- And much more….



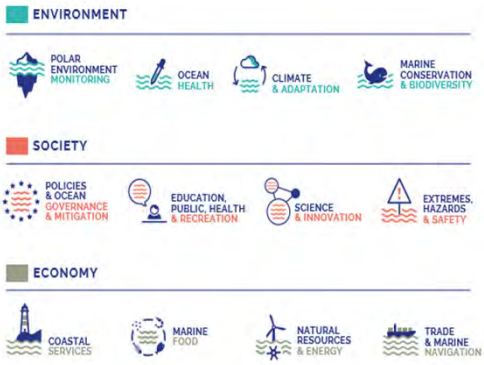
Marine Monitoring

User uptake and user engagement

Marine Monitoring

European operators, National uptake, International impact

to feed thousands o users on all continents



Hundreds of producers co-operating in Europe

for a wide range of applications and to support environmental and climate policies

More than 29 000 subscribers (+ 30% per year)

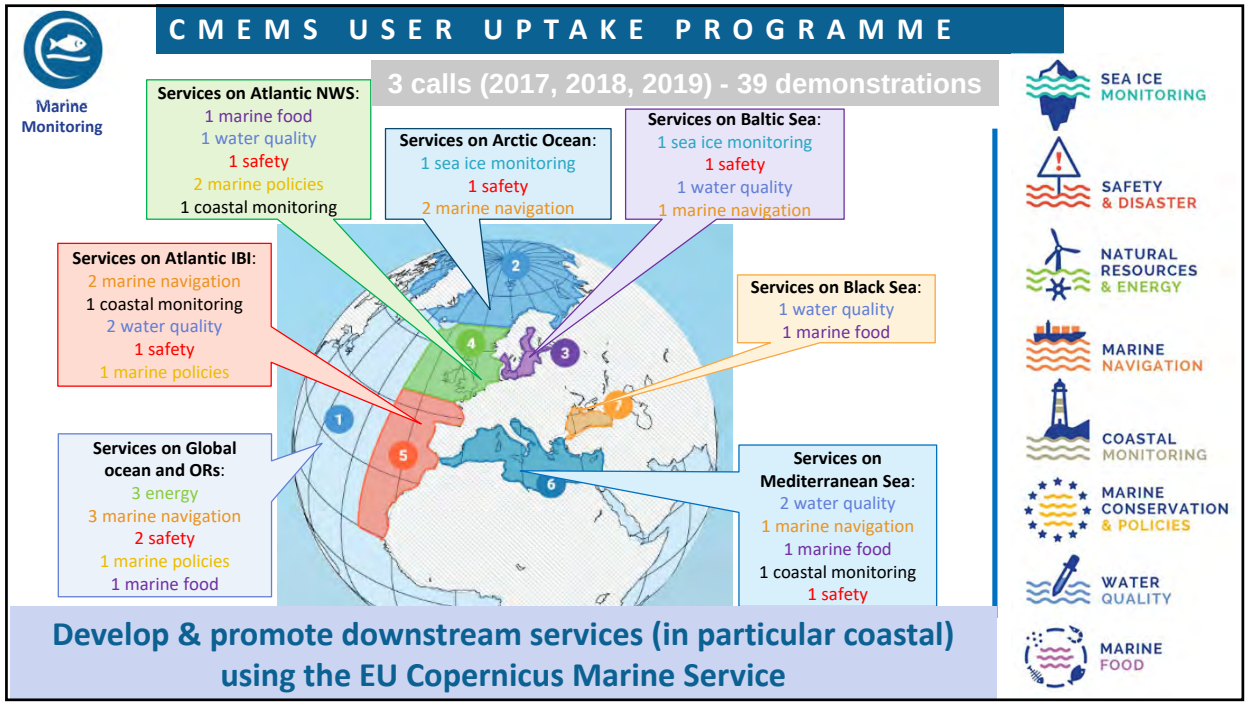
The European Green Deal

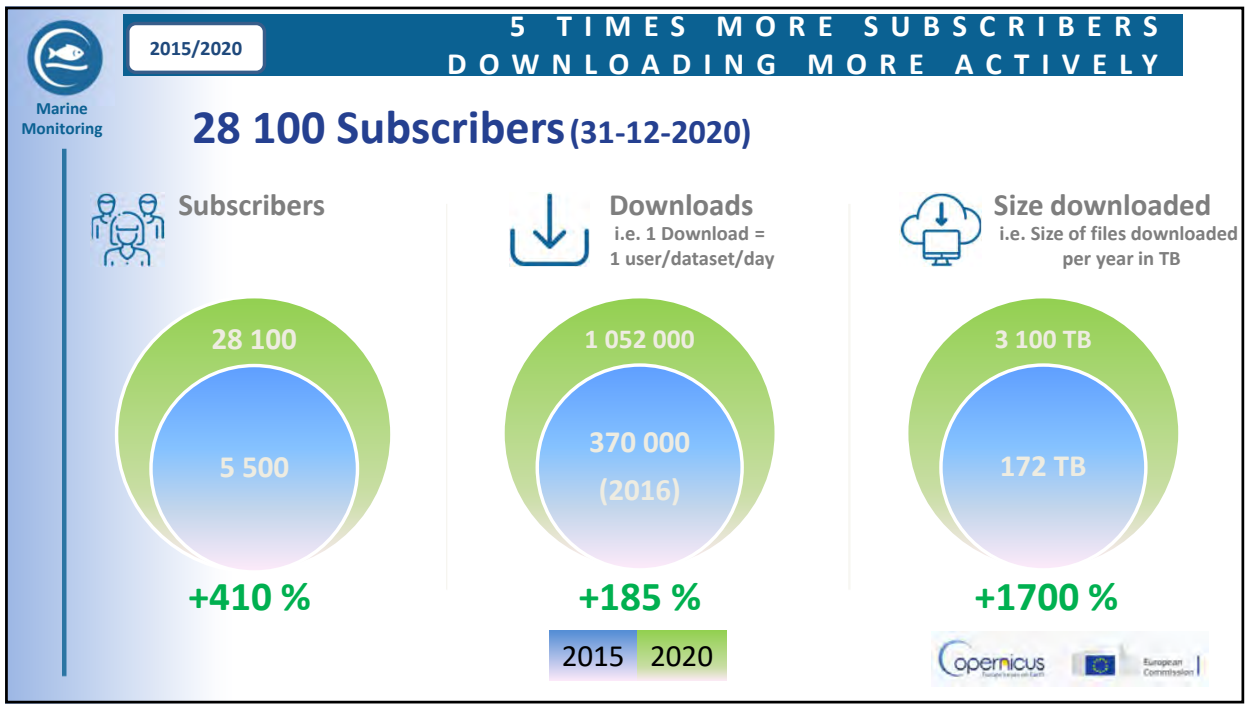
Marine Monitoring

Applications and Users

http://marine.copernicus.eu/markets/

how Copernicus Marine service data is used:
Use cases page (200 use cases)
Use cases books (per application areas, per countries)
Use cases demo page


Marine Monitoring
CMEMS USER UPTAKE PROGRAMME
3 calls (2017, 2018, 2019) - 39 demonstrations
Services on Atlantic NWS:
1 marine food
1 water quality
1 safety
2 marine policies
1 coastal monitoring
Services on Arctic Ocean:
1 sea ice monitoring
1 safety
2 marine navigation
Services on Baltic Sea:
1 sea ice monitoring
1 safety
1 water quality
1 marine navigation
Services on Atlantic IBI:
2 marine navigation
1 coastal monitoring
2 water quality
1 safety
1 marine policies
Services on Black Sea:
1 water quality
1 marine food
Services on Global ocean and ORs:
3 energy
3 marine navigation
2 safety
1 marine policies
1 marine food
Services on Mediterranean Sea:
2 water quality
1 marine navigation
1 marine food
1 coastal monitoring
1 safety
SEA ICE MONITORING
SAFETY & DISASTER
NATURAL RESOURCES & ENERGY
MARINE NAVIGATION
COASTAL MONITORING
MARINE CONSERVATION & POLICIES
WATER QUALITY
MARINE FOOD
Develop & promote downstream services (in particular coastal) using the EU Copernicus Marine Service


Marine Monitoring
2015/2020
5 TIMES MORE SUBSCRIBERS DOWNLOADING MORE ACTIVELY
28 100 Subscribers (31-12-2020)
Subscribers
28 100
5 500
+410 %
Downloads
i.e. 1 Download = 1 user/dataset/day
1 052 000
370 000 (2016)
+185 %
2015 2020
Size downloaded
i.e. Size of files downloaded per year in TB
3 100 TB
172 TB
+1700 %
Copernicus
European Commission

Service Evolution

Marine Monitoring

Copernicus

European Commission

The Copernicus Marine Service Evolution principles

Marine Monitoring

CMEMS is continuously evolving

- **Users are explicitly and transparently involved:**
  - **Users needs** drive service evolution,
  - User feedbacks and needs are regularly monitored and collected,
  - Work to translate user requirements into achievable service evolution objectives.
- **Scientific** (satellite and in-situ observations, modelling, data assimilation) **and technological** (e.g. computing capabilities, information systems & big data) **advances** relevant for the CMEMS are fully taken into account.
- Need to maintain **competitiveness** wrt international actors.
- **Innovation capacity** required to attract new users.
- **Delineation with downstream activities**:
  - The core service focuses on activities best performed at pan-European scale.

Copernicus

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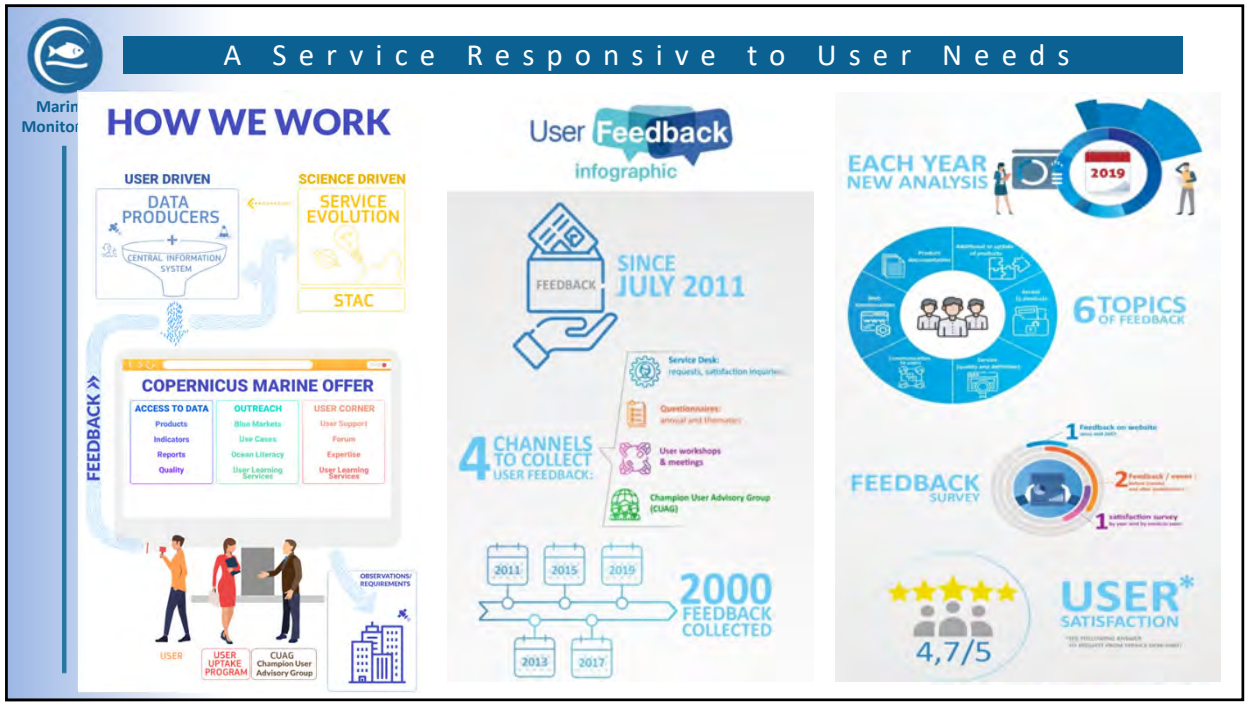
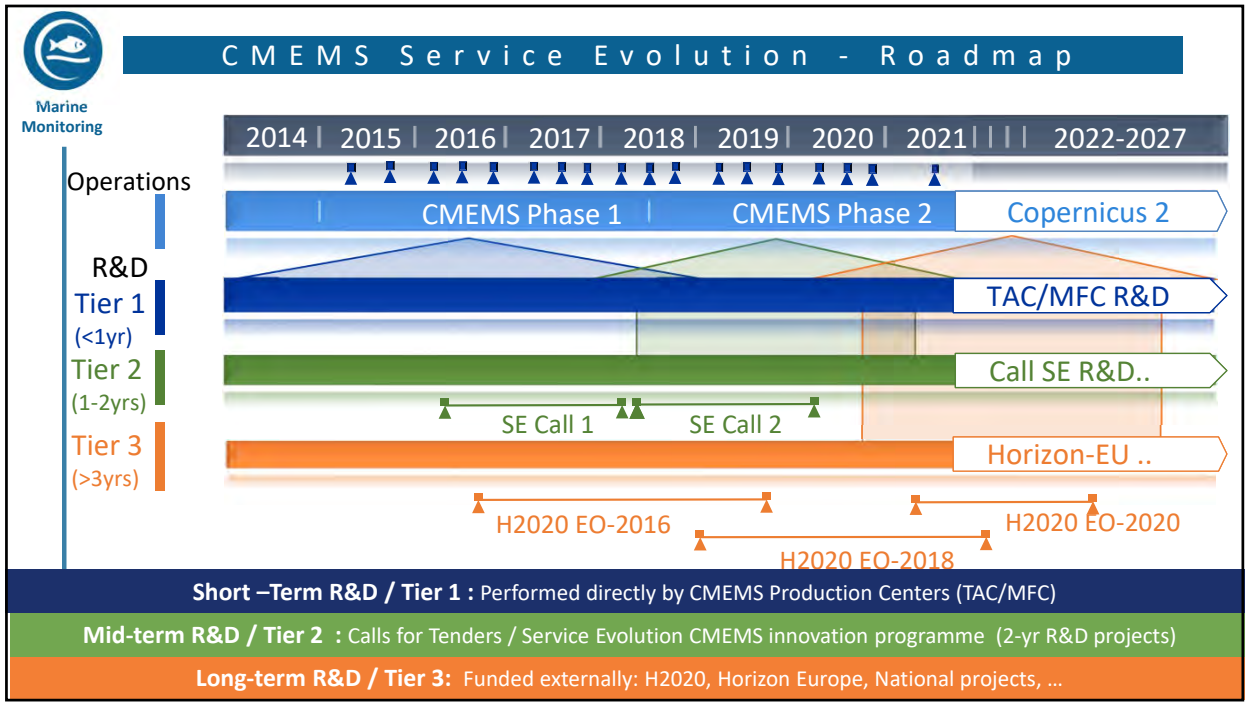
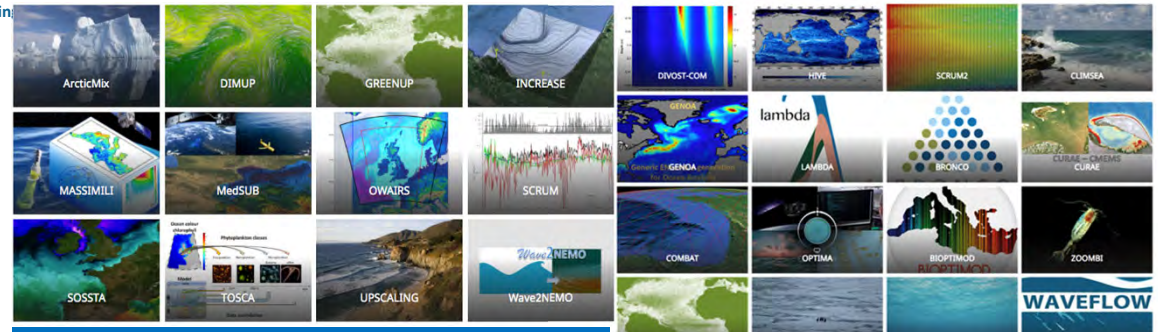

A Service Responsive to User Needs
HOW WE WORK
USER DRIVEN
DATA PRODUCERS
CENTRAL INFORMATION SYSTEM
SCIENCE DRIVEN
SERVICE EVOLUTION
STAC
FEEDBACK
COPERNICUS MARINE OFFER
ACCESS TO DATA
Products
Indicators
Reports
Quality
OUTREACH
USER CORNER
USER
USER UPTAKE PROGRAM
CUAG Champion User Advisory Group
OBSERVATIONS/ REQUIREMENTS
User Feedback
infographic
FEEDBACK
SINCE JULY 2011
4 CHANNELS TO COLLECT USER FEEDBACK:
Service Desk:
Questionnaires:
User workshops & meetings
Champion User Advisory Group (CUAG)
2011
2015
2019
2013
2017
2000 FEEDBACK COLLECTED
EACH YEAR NEW ANALYSIS
2019
6 TOPICS OF FEEDBACK
FEEDBACK SURVEY
1 Feedback on website
2 Feedback / event
1 satisfaction survey
4,7/5
USER* SATISFACTION


CMEMS Service Evolution - Roadmap
Marine Monitoring
2014
2015
2016
2017
2018
2019
2020
2021
2022-2027
Operations
CMEMS Phase 1
CMEMS Phase 2
Copernicus 2
R&D
Tier 1
(<1yr)
TAC/MFC R&D
Tier 2
(1-2yrs)
Call SE R&D..
SE Call 1
SE Call 2
Tier 3
(>3yrs)
Horizon-EU ..
H2020 EO-2016
H2020 EO-2020
H2020 EO-2018
Short –Term R&D / Tier 1 : Performed directly by CMEMS Production Centers (TAC/MFC)
Mid-term R&D / Tier 2 : Calls for Tenders / Service Evolution CMEMS innovation programme (2-yr R&D projects)
Long-term R&D / Tier 3: Funded externally: H2020, Horizon Europe, National projects, …

CMEMS Service Evolution R&D projects

First call (2016-2018) – 12 projects

Second call (2018-2020) – 18 projects



Keywords: biology, high res., coupling, ensemble, ocean & climate, waves, sea ice, **coastal, rivers**

Together with H2020 projects (e.g. Ceaseless, IMMERSE, EuroSea), SE R&D projects pave the way for the development of future versions of the Copernicus Marine Service

http://www.mercator-ocean.fr/mercator-ocean/copernicus/service-evolution/

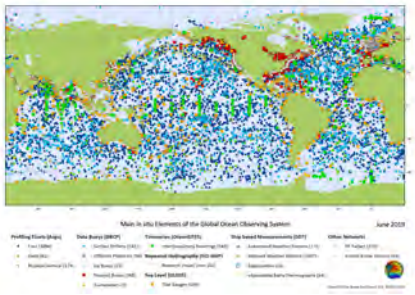
Upstream observation infrastructure

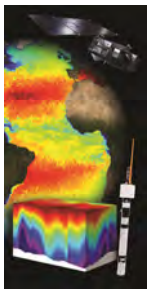
Marine Monitoring

Marine Monitoring

The essential role of observing systems

The Copernicus Marine Service is highly dependent on the satellite (Sentinels) and in-situ observing capabilities





Role of Copernicus Marine Service wrt agencies in charge of observing systems: requirements, design, impact assessment & advocacy

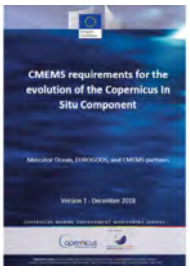
Marine Monitoring

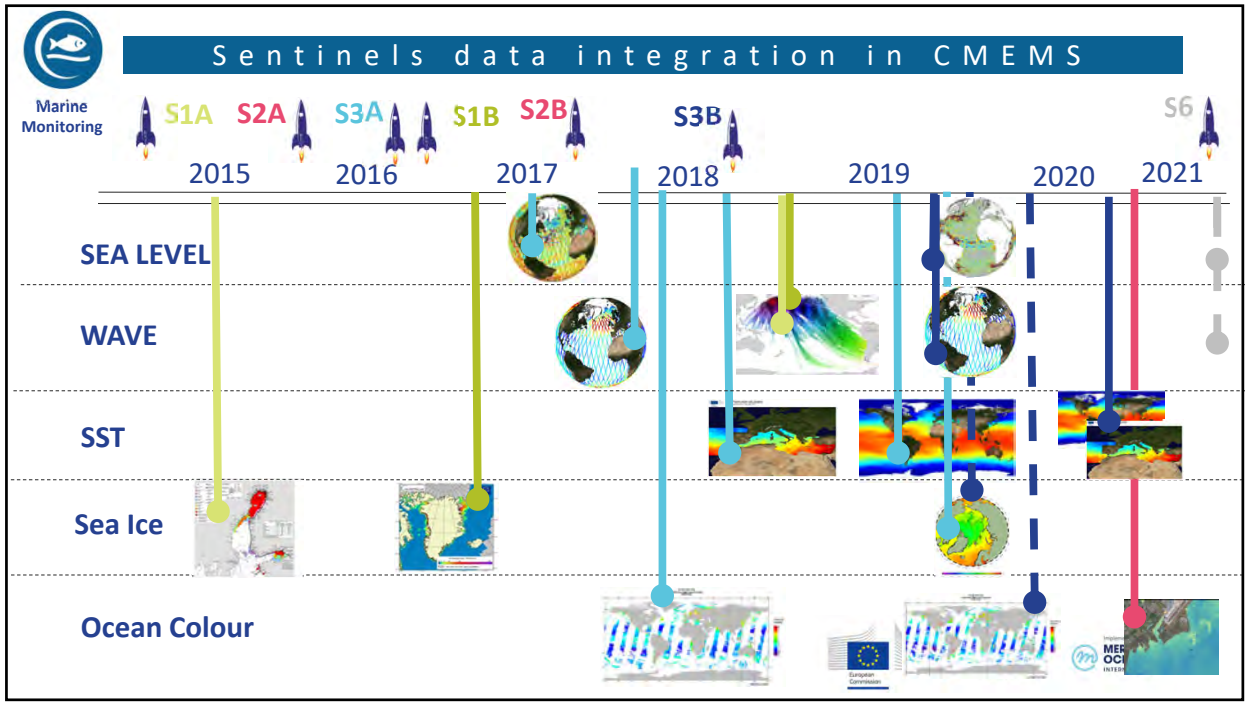
The essential role of observing systems

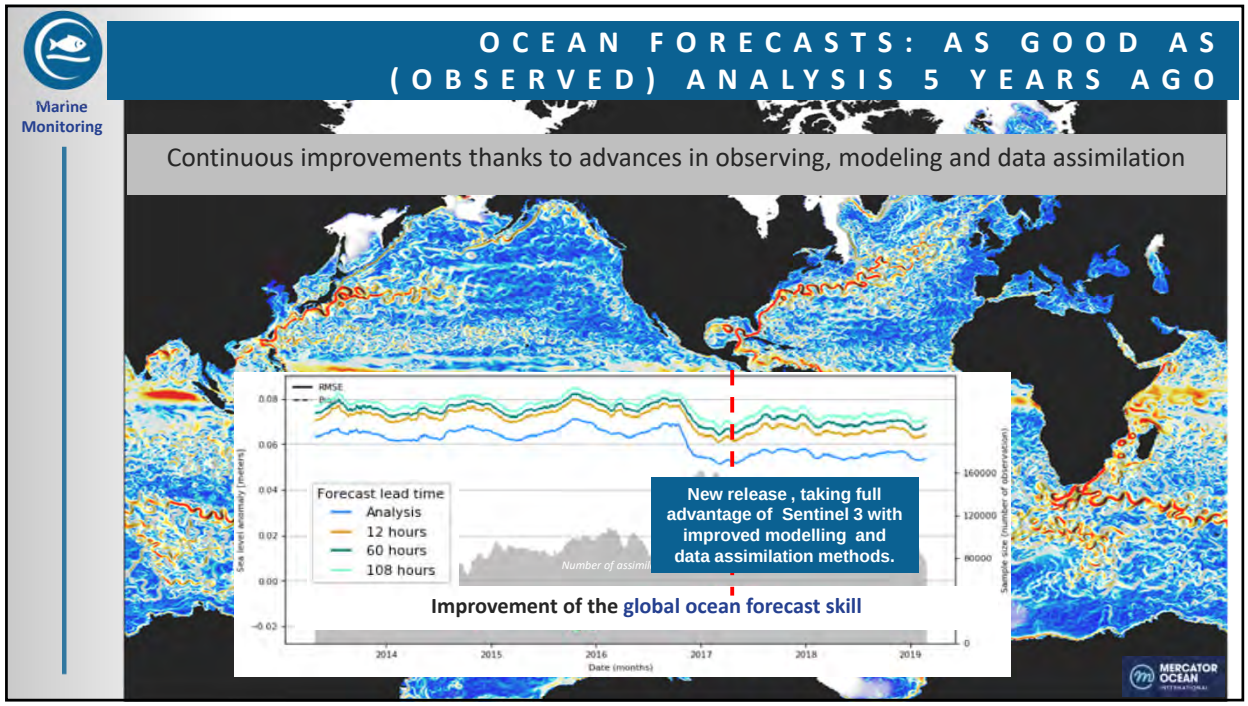
Present and future requirements both for in-situ and satellite observations (Sentinels) have been defined.

Based on impact assessment (OSE/OSSEs) and expert analyses.

Network of a large number of CMEMS experts




Marine Monitoring
Sentinels data integration in CMEMS
S1A
S2A
S3A
S1B
S2B
S3B
S6
2015
2016
2017
2018
2019
2020
2021
SEA LEVEL
WAVE
SST
Sea Ice
Ocean Colour


Marine Monitoring
OCEAN FORECASTS: AS GOOD AS (OBSERVED) ANALYSIS 5 YEARS AGO
Continuous improvements thanks to advances in observing, modeling and data assimilation
RMSE
Forecast lead time
Analysis
12 hours
60 hours
108 hours
New release , taking full advantage of Sentinel 3 with improved modelling and data assimilation methods.
Improvement of the global ocean forecast skill
Date (months)
MERCATOR OCEAN

The Copernicus Marine Service and coastal zone users

Marine Monitoring

Copernicus

European Commission

Marine Monitoring

Coastal Zone Monitoring: DRIVERS

Coastal zones:

- Tremendous social, economic & biological value but high level of pressure
- User needs for a wide range of applications
- Needs of European Policies (WFD, MSFD, MSP, Green Deal)

European Commission

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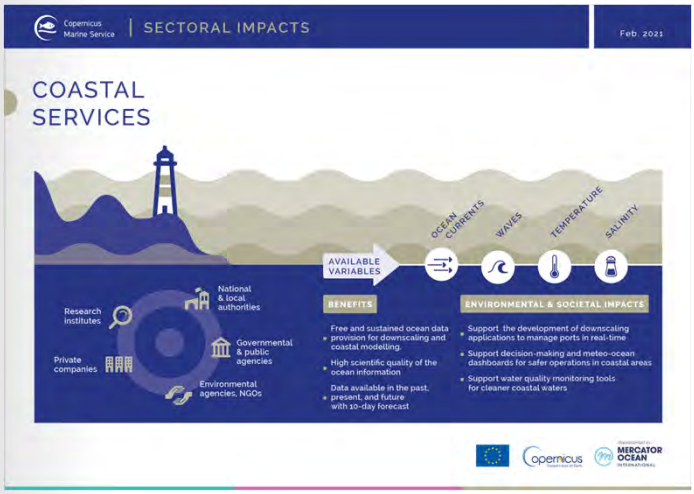
CMEMS and Coastal Users

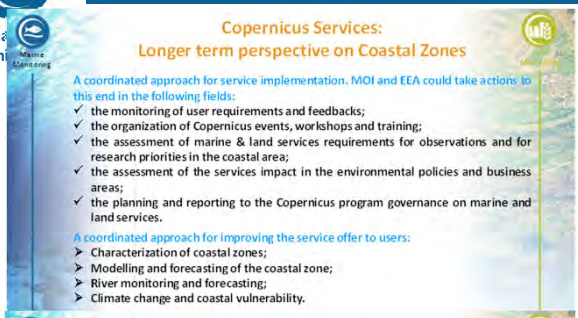
Marine Monitoring

CMEMS: a core European service that serves many downstream coastal zone applications and European policies (WFD, MSFD, MSP, Green Deal)



European Commission · Copernicus Europe's eyes on Earth · MERCATOR OCEAN INTERNATIONAL

Copernicus Coastal Roadmap (Land & Marine)



Expert workshop organized by MOI and EEA in 2016. Open workshop organized by DG GROW in 2017. MOI and EEA asked to elaborate a roadmap for the evolution of their services wrt to the coastal zone.

Roadmap delivered in December 2018. It guides coordinated actions by the two services in Copernicus 1 and (mainly) Copernicus 2.

+ MED7 White Paper

European Commission · Copernicus Europe's eyes on Earth · MERCATOR OCEAN INTERNATIONAL

Coastal users: The Copernicus Marine Service offer

Marine Monitoring

Available now

SATELLITE

Waves, sea level, sea surface temperature, winds, ocean colour, sea-ice

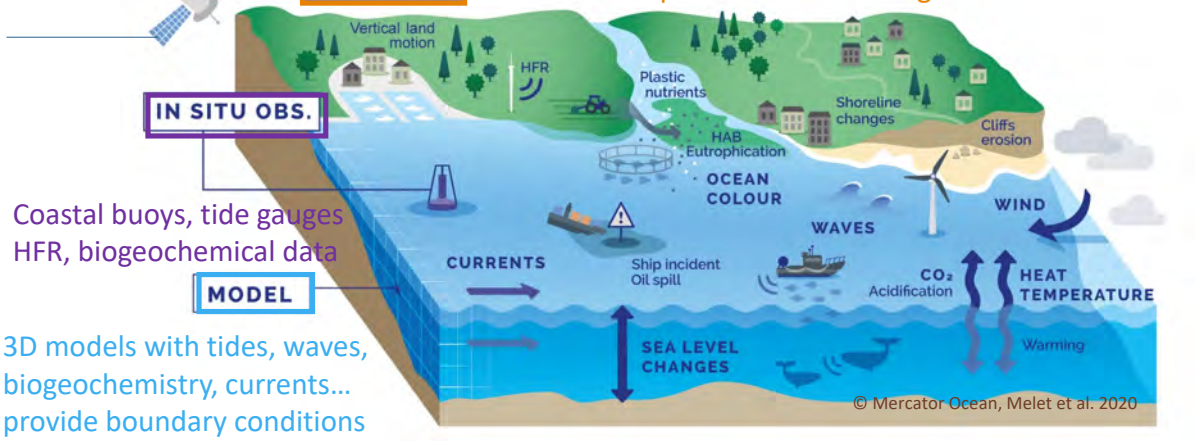
Continuous improvements including for the coastal zone

IN SITU OBS.

Coastal buoys, tide gauges
HFR, biogeochemical data

MODEL

3D models with tides, waves, biogeochemistry, currents… provide boundary conditions for coastal models ; past-present-forecast

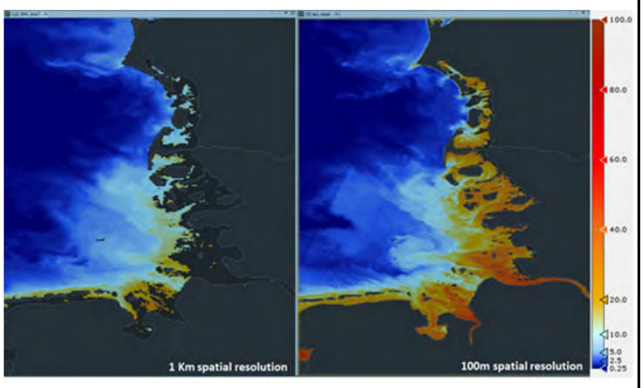


NEW HIGH-RESOLUTION OCEAN COLOR SERVICE

Marine Monitoring

A new contract has been launched early July 2020 to provide **high-resolution ocean color products** derived from **Sentinel-2** in the Copernicus Marine portfolio.

Products will be **distributed operationally from May 2021**. These new products will support the European **Marine Strategy Framework Directive (MSFD), EU Water Framework Directive (WFD), and Maritime Spatial Planning (MSP)**, as well as many downstream applications.



2021 CMEMS General Assembly

More than 600 different participants

77 Countries

3 Interactive halls with many stands

Replay available

Will remain open for the next 6 months

https://cmemsga2021.com

THANK YOU

Marine Monitoring

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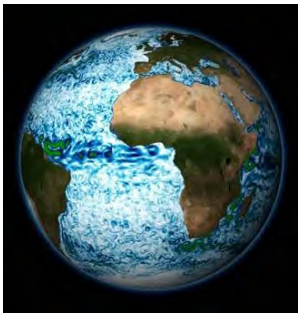

Knowing more about :

the program **copernicus.eu**
the service **marine.copernicus.eu**
the entrusted entity **mercator-ocean.eu**