Copernicus Marine Service

Plans for Copernicus 2 with a focus on the coastal zone

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Mercator Ocean International

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European Commission | Copernicus | Implemented by MERCATOR OCEAN INTERNATIONAL

OUTLINE

1. Copernicus Marine Service as of today
2. Drivers for service evolution
3. Plans for Copernicus 2
4. Plans for the coastal zone

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1

The Copernicus Marine Service

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CMEMS: An operational state of the art user and policy driven EU marine service

2

Drivers for Copernicus Marine Service Evolution

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Copernicus Marine Service - Drivers

The ocean = food, energy , global economy

Face strong pressures due to climate change and other human activities

Increasing needs of ocean monitoring and prediction capabilities from global to coastal scales:

- **To understand and predict the weather and climate evolution**
- **To develop sound mitigation and adaptation to climate change**
- **For a sustainable management of the oceans and its resources**
- **For the development of a sustainable blue economy**
- **To better protect marine ecosystems and biodiversity**






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Ocean in the European Political Agenda

EU framework:

- Stronger integration into EU policies: Green Deal, Digital Strategy, CFP, Arctic Policy, MSFD, MSP, International Ocean Governance.

International framework:

- Ocean Decade, G7 FSOI, UN/SDG, GEO, IPCC, UNFCC, CBD, Sendai

CFP

Marine knowledge

MSFD MSP

IPCC

GEO

Convention on Biological Diversity

G7 FUTURE OF THE SEAS AND OCEANS (FSOI)

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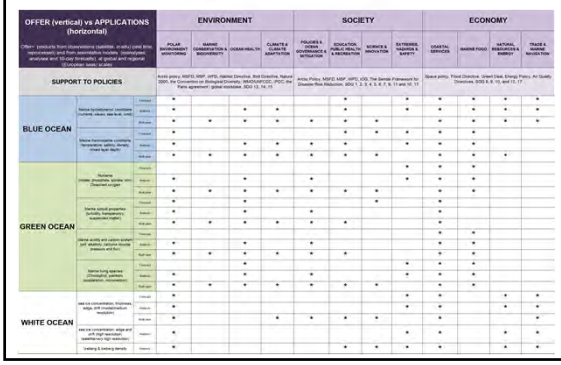
User and Policy Needs

EUROPEAN COMMISSION

Brussels, 25.10.2019
SWD(2019) 394 final

COMMISSION STAFF WORKING DOCUMENT

Expression of User Needs for the Copernicus Programme



User requirements for Copernicus 2 detailed in the EC Staff Working Document (SWD, 2019) based on marine user requirements gathered by EC and CMEMS

User and Policy Driven

Green Deal, Space Policy, Digital Strategy, Arctic Policy, Marine Strategy, Maritime Spatial Planning, UN Biodiversity Convention, UNFCC, Paris Agreement,…

Fishery, aquaculture, marine renewable energy, maritime transport & safety, climate and climate adaptation, coastal zone management

Coastal, high resolution, climate projection, biology (plankton to fish, scenarios) & biodiversity

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Main drivers guiding CMEMS long term evolutions

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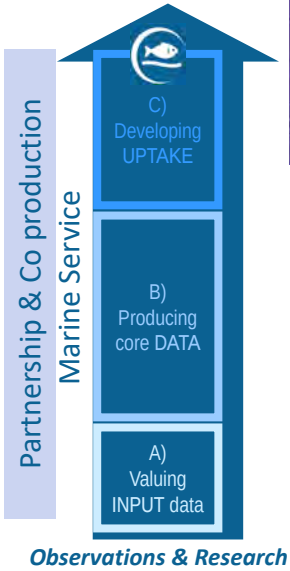
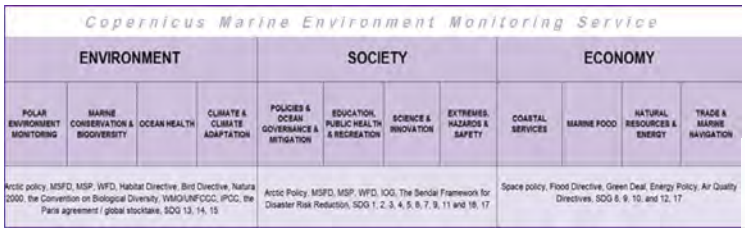
Policies, Users and markets





The European Green Deal

SUSTAINABLE DEVELOPMENT GOALS

- The Ocean **higher than ever** on the **political agenda**
- **Increasing user&policy needs**
- Users calling for a consistent **BLUE /WHITE/GREEN** offer

- **Continuity of service with incremental evolutions**
- **Coastal, Arctic, Marine Biology & Climate calling for more**
- **Integration of WEkEO/Cloud based digital approaches**
- **Strengthen links between the different Copernicus Services**

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3

Copernicus Marine Service : Plan for Copernicus 2

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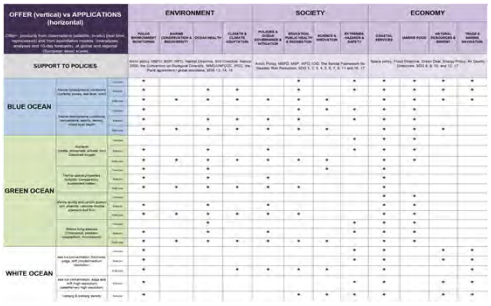
An ambitious plan for 2021 - 2027

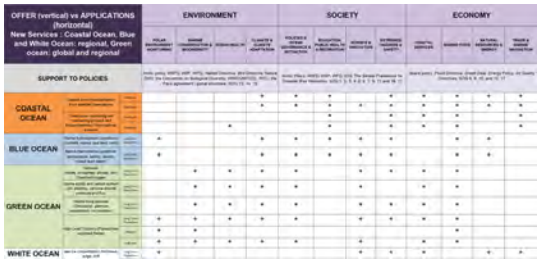
An ambitious 7-year plan that allows a staged implementation depending on budget implementation, user needs and priorities and feasibility/maturity

3 levels of implementation : baseline, enhanced continuity, new services

Products versus Users and Policy Needs



Baseline, enhanced continuity



New services

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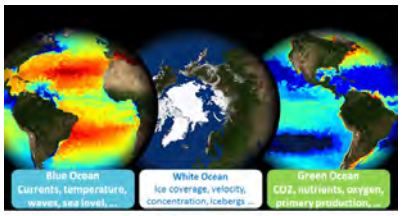
Baseline

Continuity of the current service

BLUE / WHITE / GREEN Offer: observations and models
GLOBAL AND REGIONAL
Expert assessments / Ocean State Report
National Uptake, International impact



- **Regular incremental evolutions (products and services)**
  - ✓ Improved product quality and product quality assessment
  - ✓ Marine Data Store and WEkEO platform / cloud services
  - ✓ Dedicated sectorial offers per applications & policies
  - ✓ Training and capacity building
- **Integration of Sentinels S1,2,3 & 6 A/B+C/D and in situ (eg BGC Argo)**
- **Governance: Proposition to set up a National Marine Stakeholders' committee**
- **Program consistency: Production of Marine Data for other Copernicus services (C3S, CEMS, ...)**

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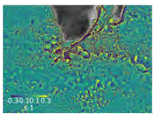
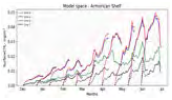
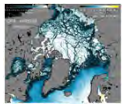
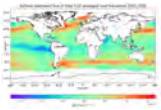
Enhanced continuity

Major product improvements

To better answer user needs and to keep the service at the state-of-the-art:

- Improved digital/cloud services
- Higher resolution
- Ensemble forecasts and extended range forecasts
- Arctic / step changes
- Air/sea CO2 fluxes
- 20th century reanalyses

Enhanced continuity activities will be developed depending on priorities, precursor projects (H2020, Horizon Europe) and budget constraints.

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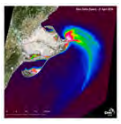
New Services

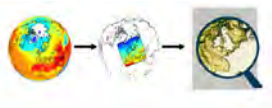
New and innovative services

To meet the new ocean monitoring & forecasting challenges required by European policies and users and to remain at the fore front of international developments :

- **Coastal**
- Marine biology
- Climate projections (coastal&ecosytems)





New services will be developed depending on priorities, precursor projects (H2020, Horizon Europe) and budget constraints.

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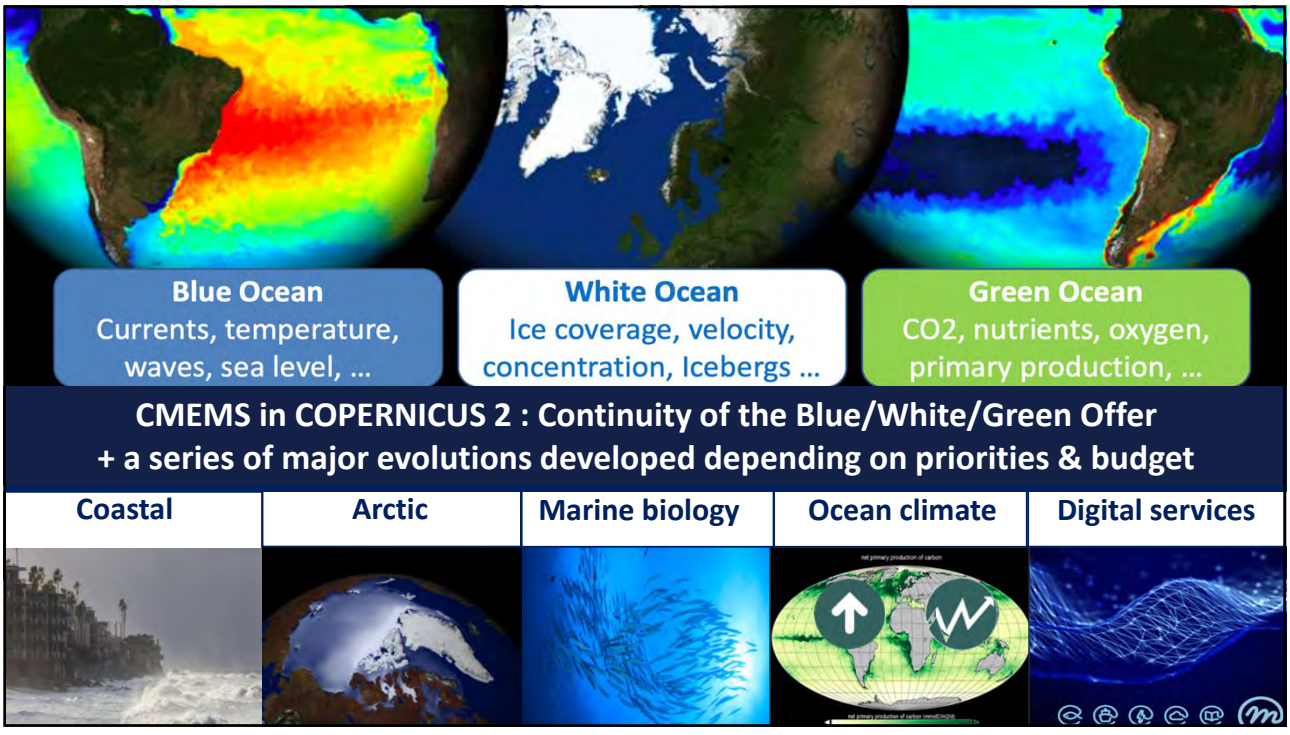
Interfaces with the other Copernicus Services

Specific products will / could be prepared for the other services:

- Climate reprocessing of satellite ocean ECVs at the request of the Climate Change service **(C3S).**
- European sea level and wave forecasts products as inputs for coastal flooding modelling for the Emergency Service (**CEMS**).
- Air/sea fluxes of CO2 as required by the **CO2** service .
- Monitoring of tropical cyclones from Sentinel 1 for the Emergency Service (**CEMS**).

Copernicus Knowledge Hubs (CKHs) :

CKHs will gather the ensemble of information generated by several Copernicus services for a given high level topic. MOi identified to lead a Coastal and an Arctic hub. Use of WEkEO infrastructure.



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Plans for the coastal zone

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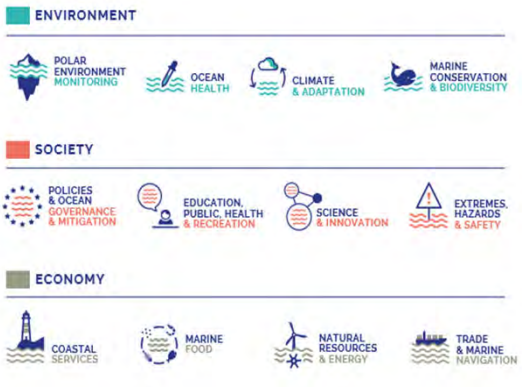
Coastal Zone Monitoring: DRIVERS

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)



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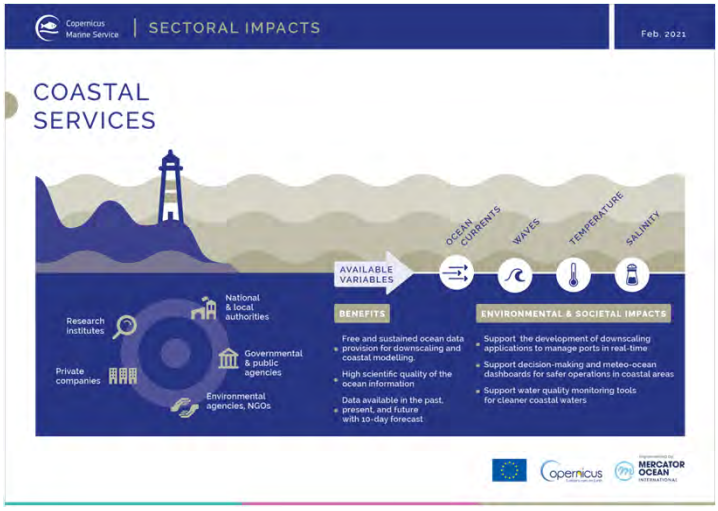
CMEMS and Coastal Users

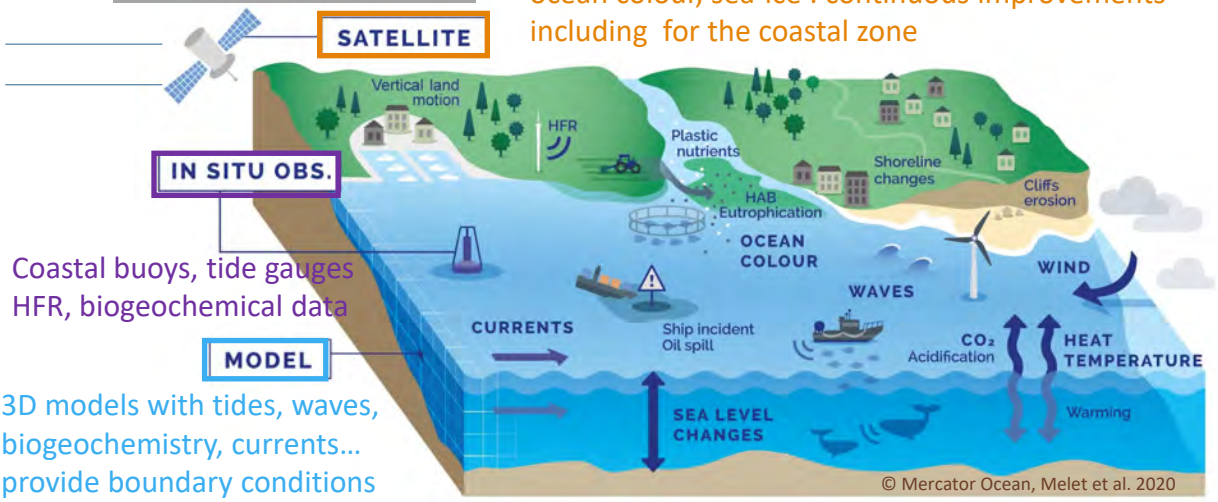
CMEMS: a core European service that serves many downstream coastal zone applications and European policies (WFD, MSFD, MSP, Green Deal)



Coastal users: The Copernicus Marine Service offer

Available now and in Copernicus 2 baseline

Waves, sea level, sea surface temperature, winds, ocean colour, sea-ice : continuous improvements including for the coastal zone



Coastal buoys, tide gauges HFR, biogeochemical data

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

Evolution of CMEMS for Coastal Users

Coastal zone hazards and monitoring

Improving CMEMS offer for Coastal Zone monitoring and forecasting - User & Policy needs

Synergy with other Copernicus Services and EMODnet

Copernicus Marine Service Copernicus Land Service

Evolution of CMEMS for coastal zones

Copernicus Environment Monitoring Service

MERCATOR OCEAN INTERNATIONAL Copernicus European Environment Agency

Roadmap for the evolution of Copernicus marine and land services to better serve coastal users

December 5th, 2018

+ MED7 White Paper

+ Discussion engaged with

Evolution of CMEMS for Coastal Users

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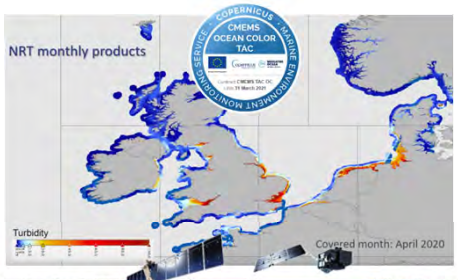
Pan-European monitoring of coastal zones : improved and new satellite derived products

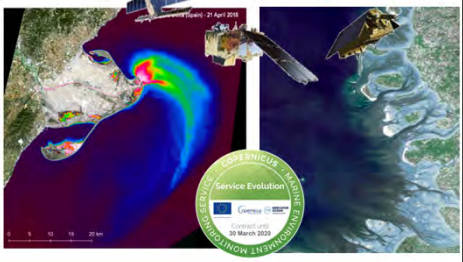
New products in Copernicus 1:

- High-resolution (5Hz) along-track altimetry (SLA)
- S2 Turbidity, Chl, SPM, RRS in coastal areas from (May 2021)
- S3 OLCI at full resolution (300m) in coastal zones (May 2021)



Potential new products (concertation with MS):

- Dynamic, time-evolving nearshore bathymetry (link EMODnet)
- High-resolution winds
- In-situ data (JERICO, link EMODnet)
- Spectral wave information in EU coastal zone
- Detection of plastic debris and monitoring of marine litter (depending on R&D advances)



To be developed depending on priorities, precursor projects (H2020, Horizon Europe) and budget constraints.

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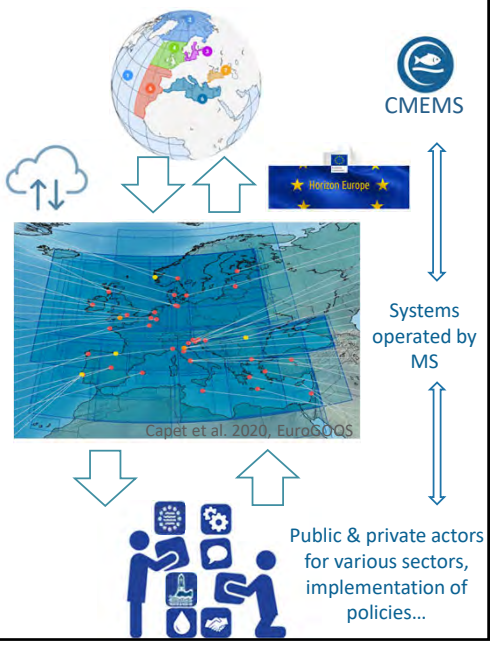
Evolution of CMEMS for coastal users

Co-production of model-derived info between CMEMS & Member States services:

(1) Full coupling between **CMEMS** & a series of **coastal models** operated by MS:

- **Co-designed cloud environment & tools for co-production** (Copernicus Marine Data Store)
- **Forcing conditions / Enhanced consistency in represented processes** (physics + bio) between the regional and coastal models:
  - Tides, HF processes, coupling effects, smaller scales….
  - Consistent datasets and forcing fields, operational and flexible interfaces, common standards, …
  - Standardized methods to couple hydrological models with global, regional and coastal ocean models

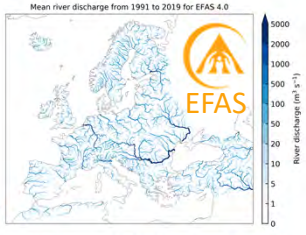
H2020

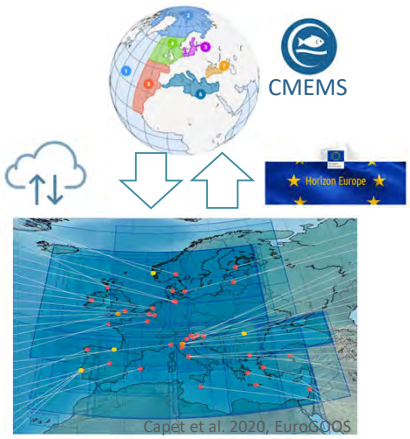


Evolution of CMEMS for Coastal Users

Co-production of model-derived info between CMEMS & Member States services:

(2) Provision of past-present-forecasted time-series of **standardized modelled river discharges** (freshwater, nutrients, particulate and dissolved matter)





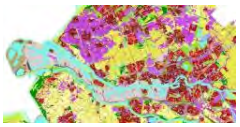
(3) Integration in CMEMS portfolio of **coastal model derived info**

Horizon Europe

To be developed depending on priorities, precursor projects (H2020, Horizon Europe) and budget constraints.

Copernicus Coastal Knowledge Hub – Copernicus 2

Interfaces and synergies between the **different Copernicus services** will be **strengthened in Copernicus 2**.



Copernicus Knowledge Hubs (CKH) proposed to regroup under one single entry point the information generated by several Copernicus services for a given high level topic.

⇒ Collect and maintain in a single catalogue the relevant products and information.

⇒ Harmonize these inputs and provide to users guidance and support with the help of the contributing Copernicus services.

MOi identified to lead a **Copernicus Coastal Knowledge Hub** together with EEA, JRC and ECMWF (marine, land, emergency and climate change services). Use of WEkEO/DIAS infrastructure for the Coastal CKH proposed

A one-stop coastal portal with a **central service desk** and an **integrated catalogue** including products from **Copernicus services**, **Sentinel data** and **possibly other providers** such as EMODnet.

Copernicus Knowledge Hub for Coastal Zones

A Coastal Copernicus Knowledge Hub could progressively offer:

- ✓ A **step-change characterization of coastal zones (land & marine)**, for both its environmental state but also its economic activity, infrastructures, population, and vulnerability: coastal-specific products and high resolution on land cover/land use, bathymetry and topography, ground motion, coast geology, shoreline position / erosion and the marine environment .
- ✓ **Modelling and forecasting of the marine coastal zones**: model products from CMEMS including seamless interfaces with downstream coastal systems.
- ✓ **River monitoring and forecasting** : Improved hydrological observation-based products (topology rivers, lakes, coasts, river discharge), modelled EU river discharges as well as water quality.
- ✓ **Coastal flooding**: hydrological floods and marine flooding from storm surges.
- ✓ **Climate change in the coastal zone and climate resilience** : products on regional marine climate change through the downscaling of global climate projections.

Evolution of CMEMS for Coastal Users / Next steps

Depending on the decision of the EC to start the implementation of Coastal Marine Extensions in Copernicus 2:

- ❑ Discussion with member states on first priorities (national marine stakeholder forum) (2021/2022)
- ❑ Start the implementation of new "core" European coastal satellite products (from 2022)
- ❑ Start the implementation of improvements of interfaces between CMEMS models and coastal systems operated by member states (from 2022)

Depending on the decision of the EC to start the implementation of the Copernicus Coastal Knowledge Hub:

- ❑ Start implementing a first version of the Copernicus Coastal Knowledge Hub (from 2022)

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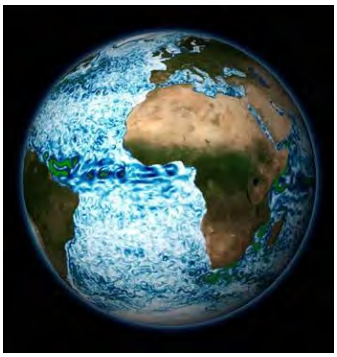

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