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Operational reporting of SDG 14.1.1 indicator in Portugal and Cape Verde based on CMEMS data

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EO4SURE (Earth Observation for Sustainable Use of Resources) focus on the implementation of Earth Observation (EO) pipelines to support the reporting of the United Nations Sustainable Development Goals (SDGs) related to the preservation of inland, coastal and ocean water resources and their associated environments.

During 2026, EO4SURE will implement an EO-based data production pipeline to contribute to the reporting of **SDG indicator 14.1.1 - Index of Coastal Eutrophication and floating plastic debris density.** This will entail practical demonstrations in Portugal and Cape Verde, with the generation of standardised statistics on Sub indicator 1.1: Surface Chlorophyll-a concentration as an indicator of phytoplankton biomass.

Main user requirements

EO4SURE promoted Living Labs with local authorities and scientific bodies directly engage in producing data and statistics on coastal water quality, defining key drivers for solution design and implementation. Scalability, fusion with reference in situ data and control of EO limitations were deemed particularly important.

Scalable indicator pipeline

Reliable and scalable monitoring pipelines for SDG Indicator 14.1.1a should be provided, which could be readily adapted for other regions and integrated in different digital infrastructures

Geographical coverage + fusion EO & in situ

SDG indicator 14.1.1a Level 2 should be produced with national coverage, informed by comparison with in situ data from DQEM/MSFD.

Spatial resolution

SDG indicator 14.1.1a Level 2 should be derived from products with better spatial resolution than the 4km used at Level 1.

EO uncertainty & other limitations

Uncertainties and other limitations associated with satellite data to be used for SDG Indicator 14.1.1a should be assessed under different environmental conditions.

Areas of special interest

Areas of greater interest should be defined, where the in-situ data of the MSFD should be compiled to generate SDG statistics. Either the regions with the highest risk of eutrophication, or those in which the uncertainties associated with satellite data are greater.

Risk of eutrophication & algal blooms

Generate indicators for the risk of eutrophication and/or algal blooms events for the SDG indicator 14.1.1a Level 3. Shall be derived by retrieving records of such events cross-analysed with environmental parameters from EO.

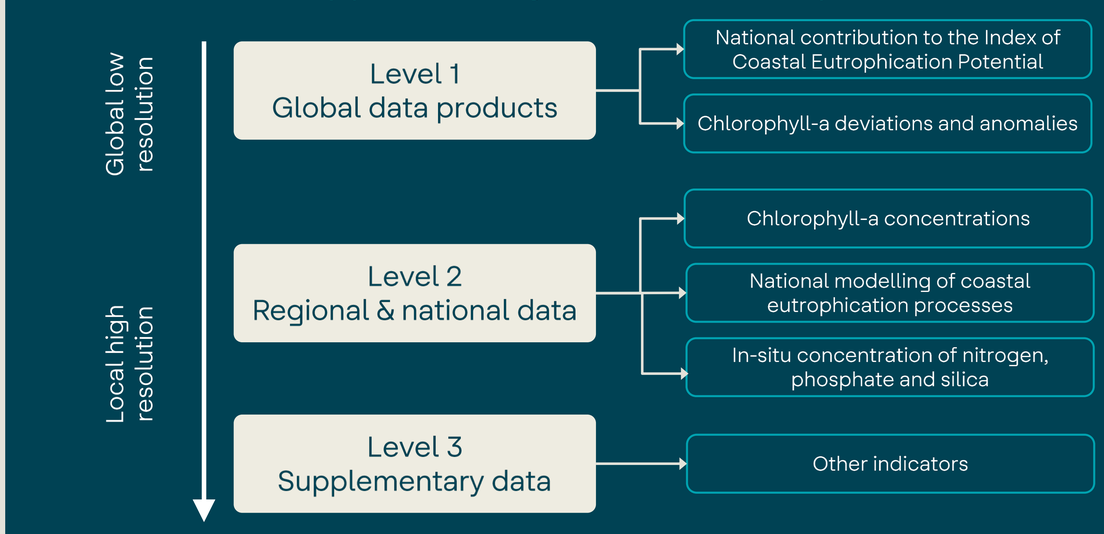
SST, salinity & Secchi depth

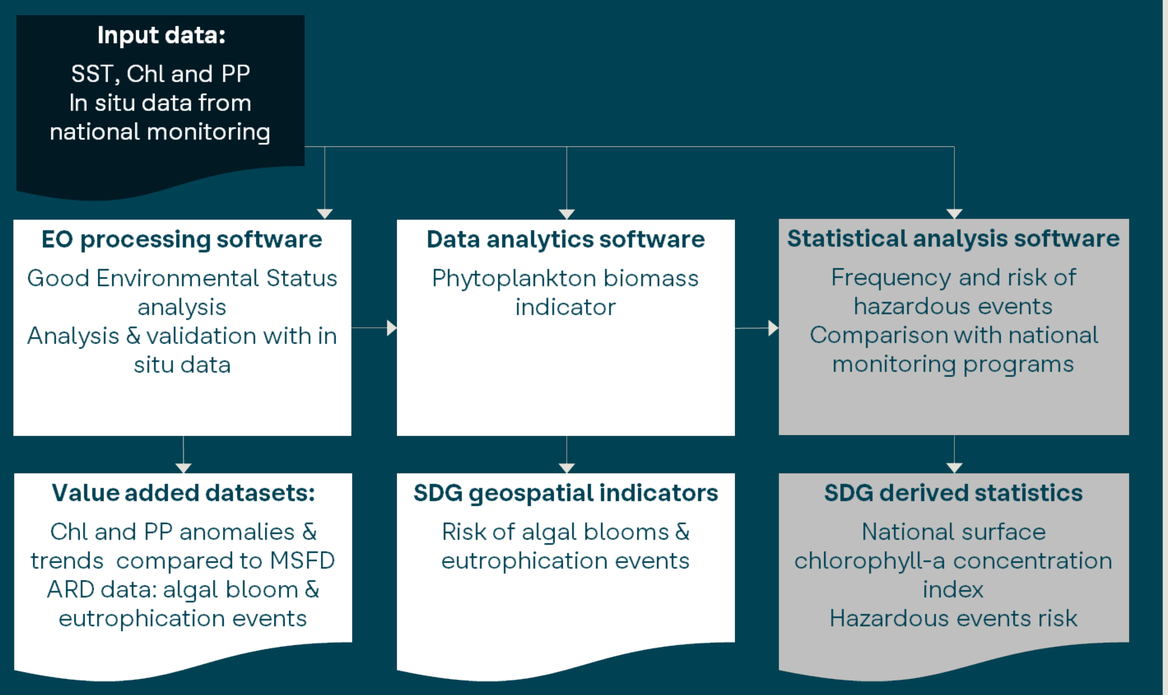
Generate national scale indicators for sea surface temperature, salinity and Secchi depth for the SDG indicator 14.1.1a Level 3 using products provided in CMEMS.

Monitoring chlorophyll-a as a proxy of eutrophication and hazardous algal bloom events

Chlorophyll-a is widely used to assess eutrophication risk under the European MSFD and many other initiatives, and satellite data enable regular and efficient monitoring.

In EO4SURE, a progressive approach is adopted, following the methodology recommended by UNEP[1]. It includes global-scale indicators based on CMEMS, nationally calibrated products combining in situ and remote sensing observations, specific risk indicators and supplementary environmental parameters.





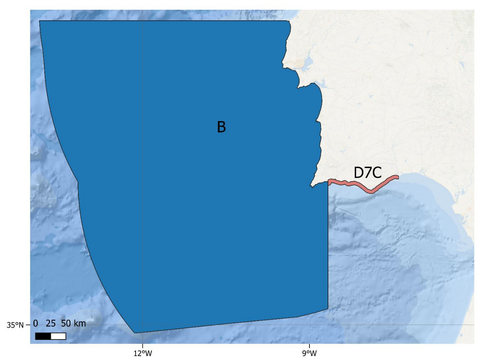
Main products to be provided:

- ✓surface chlorophyll-a concentration
- ✓SST, primary productivity
- ✓salinity and Secchi depth
- ✓risk of eutrophication
- ✓risk of algal blooms

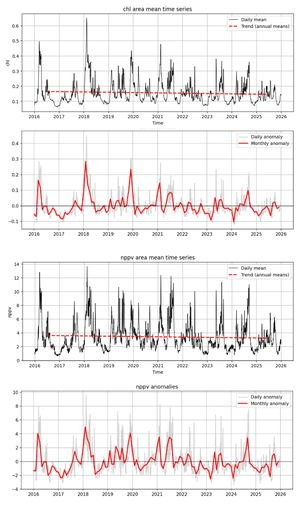
[1]United Nations Environment Programme (2021). Understanding the State of the Ocean: A Global Manual on Measuring SDG 14.1.1, SDG 14.2.1 and SDG 14.5.1. Nairobi. Available at: *https://wedocs.unep.org/handle/20.500.11822/35086*

Preliminary results and planned demonstration

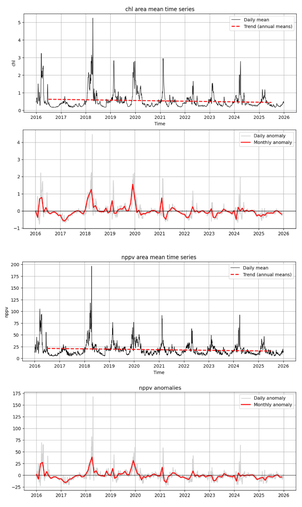
A key feature of the project is the automatic monitoring of the defined reporting areas (two examples here), where thresholds will be calibrated with in situ reference data.

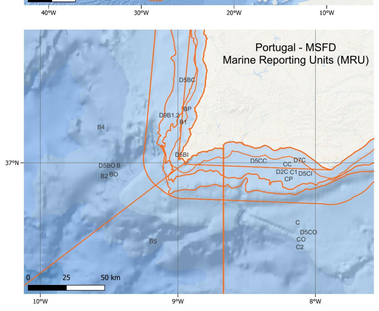


Results from area B



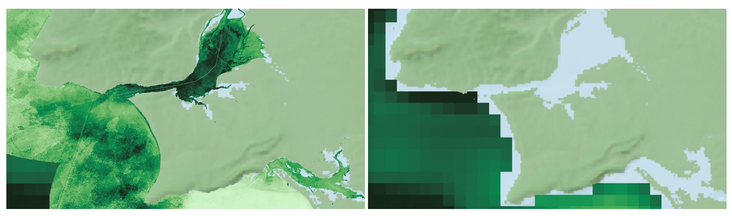
Results from area D7C





During the demonstration in Portugal, automated monitoring and statistics generation will be performed for designated areas, coping with the complex overlaps of the current MSFD MRU scheme in the country. Zones of special interest near the coast shall also be defined, where different input data and specially adapted algorithms will be employed for better accuracy.

EO4SURE will benchmark different HR ocean colour products from CMEMS and others, as input for statistic generation at national level, increasing the potential to detect peaks and anomalies.



Outputs of the algorithms will be disseminated through SEAMInd, a digital platform implemented by DGPM to display maritime indicators, whose first public version shall be released in 2026. The resulting pipeline shall be integrated within DGPM's digital infrastructure, as to support regular SDG 14 reporting.

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