# Validated downstream services for water quality In coastal and inland waters

**CoastObs**

COMMERCIAL SERVICE PLATFORM FOR USER-RELEVANT COASTAL WATER MONITORING SERVICES BASED ON EARTH OBSERVATION

**https://coastobs.eu/**

**EOMORES**

Earth Observation based services for Monitoring and Reporting of Ecological Status

**https://eomores-h2020.eu/**

The users in the driver's seat

*CoastObs and EOMORES have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreements n° 776348 and n° 730066*

# Common objectives of our downstream projects

- Develop user relevant water quality information products for clients
- Operationalise the production of water quality information products
- Build value chains with with local/regional renown R&D institutes and clients
- Work according to iterative principles:

**Technology push** ⟲ Requirements, Development, Demonstration, Fine-tuning ⟲ **User pull**

- Implement operational services and ensure user uptake (matching user requirements and product and system development)
- Commercial service provision (lower cost of production by automated production and target users with overlapping requirements

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## Common workflow of our downstream projects

**Service components**
- Earth Observation (pre-) processing
- Models
- In-situ observations

**Service integration Operational implementation**
- Automation of services
- Delivery through:
- (third party) Webportals / FTP

**Commercialisation**
- From consortium agreement to MoU
- IP management
- Marketing
- Business model including pricing models

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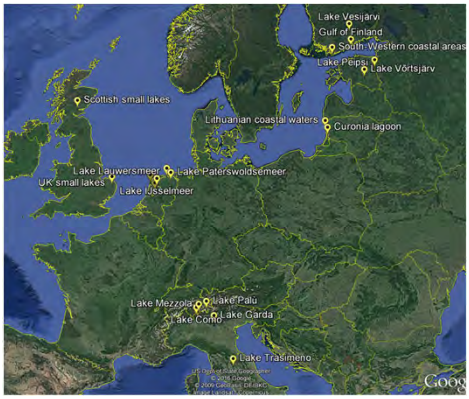
## Users / case studies for service development




Many lakes: focus on ecological status

EO driven mussels growth prediction

Seagrass monitoring

Case studies





Harmful algae blooms & Mussels

Water quality variability

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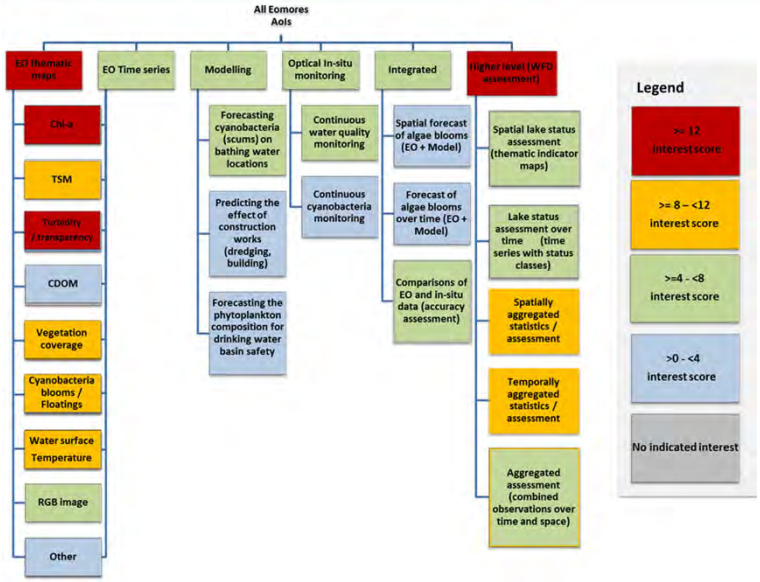
## Initial user requirements: EOMORES

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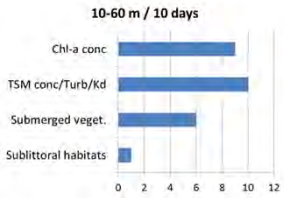
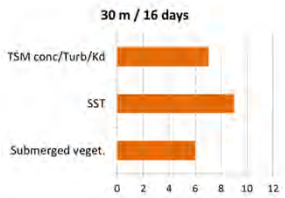
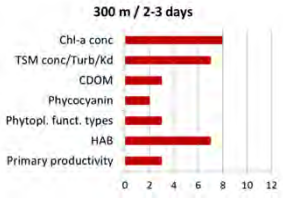
## Initial user (product type) requirements: CoastObs



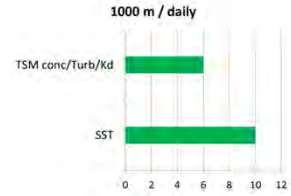

Sentinel-2 based




Landsat-8 based




Sentinel-3 based




Other sources like CMEMS

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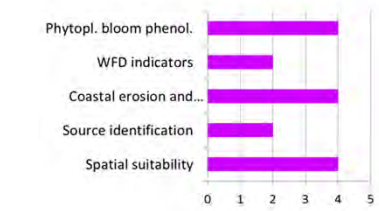
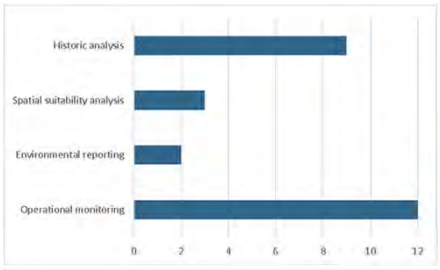
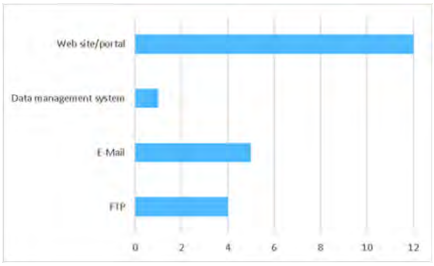
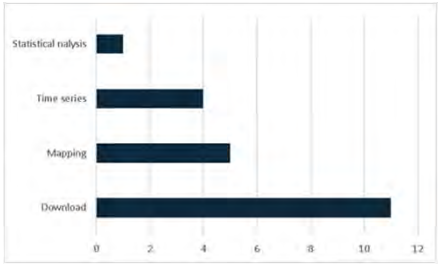
## Initial service requirements: CoastObs

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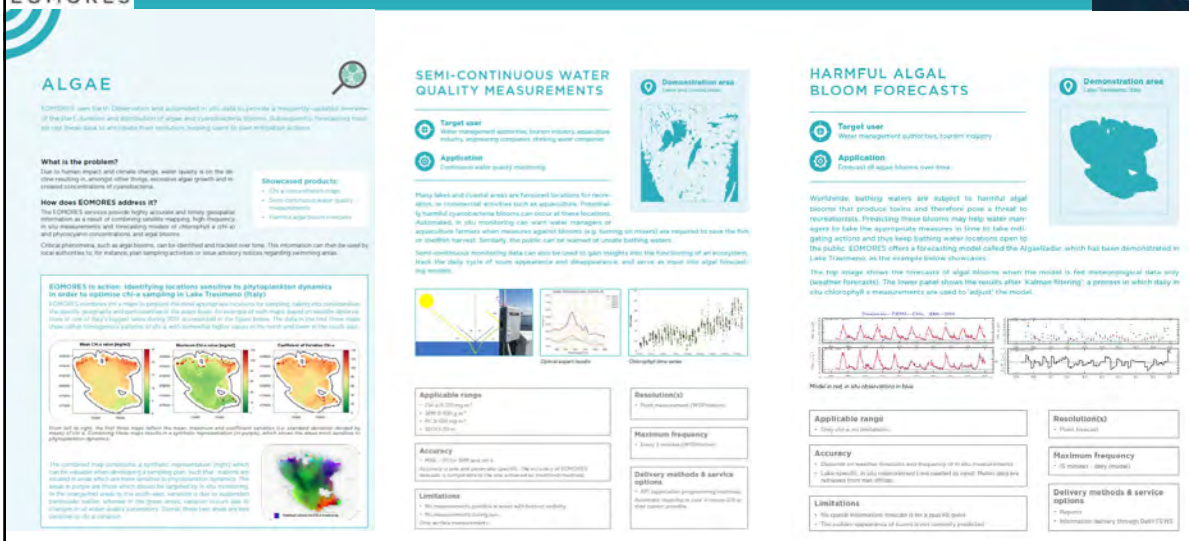
## EOMORES Service portfolio example (EO, In-situ, Model)




**https://eomores.eu/wp-content/uploads/2020/01/2020_01_13_Product_portfolio_small.pdf**

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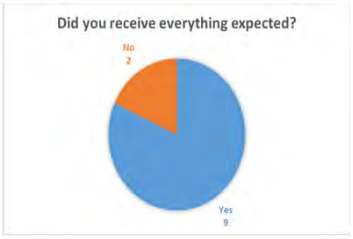
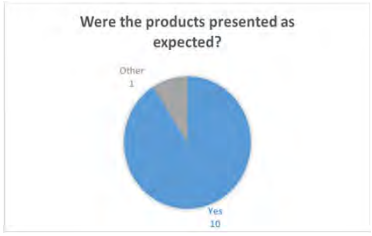
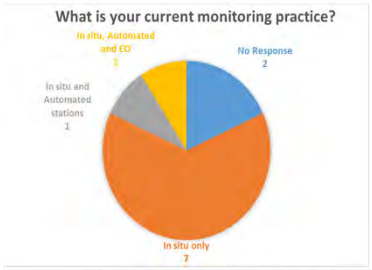
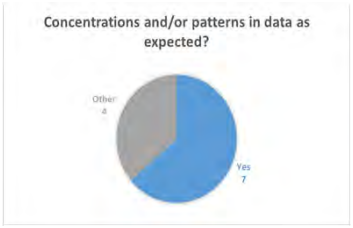
# EOMORES Service validation results

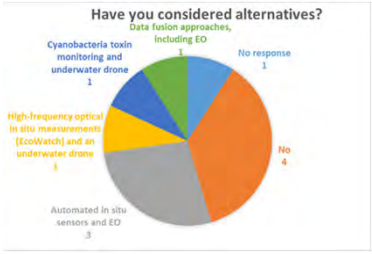




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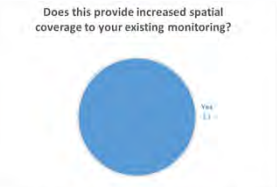


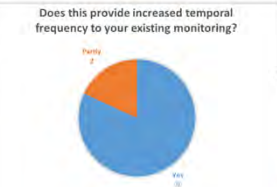


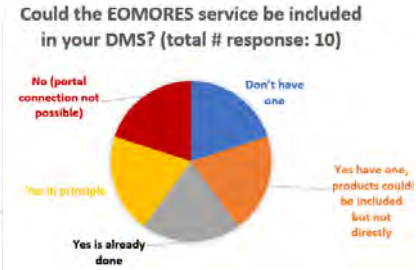


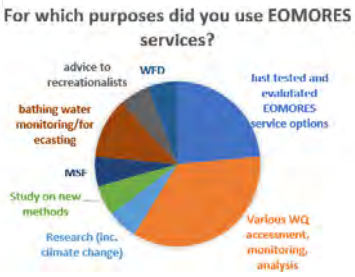


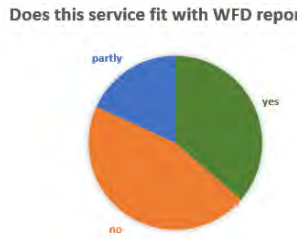



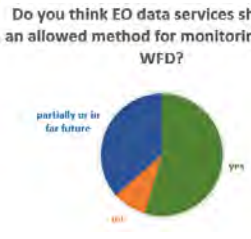


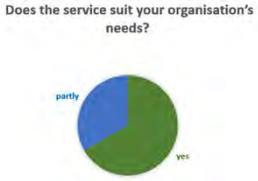


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## EOMORES and CoastObs: response to policy makers

### Satellite-assisted monitoring of water quality to support the implementation of the Water Framework Directive

To promote and support the use of satellite-based water quality metrics in WFD national and statutory monitoring and reporting activities, we make the following recommendations, particularly in light of the ongoing revision of the WFD:

- Recognition of satellite observation as an assessment method in the context of the revision of the Water Framework Directive.
- Create a satellite observation expert group to harmonise metrics across countries and advise member states on best practises.
- Reference the use of satellite-based Earth observation metrics in the Reporting Guidance (Annex 5) of the revised Water Framework Directive.
- Convene a conference for EC, Member States, WFD authorities to agree on recommendations of common practices and reporting standards when using satellite-based water quality metrics to support the Water Framework Directive.

Papathanaopoulou, E., Simis, S. *et al*. 2019. Satellite-assisted monitoring of water quality to support the implementation of the Water Framework Directive. *EOMORES white paper*. 28pp. doi: 10.5281/zenodo.3463050

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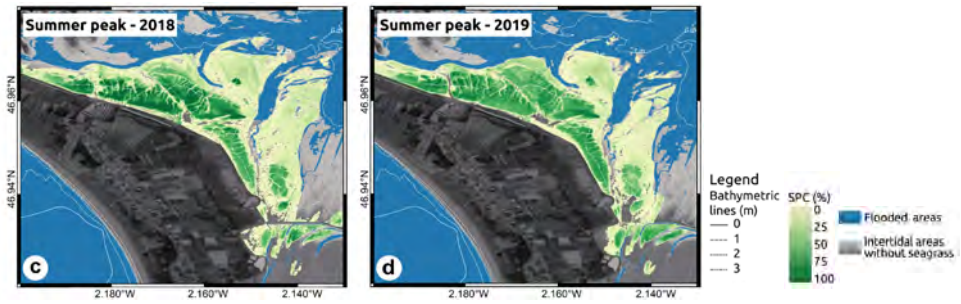
## Coastobs service examples South Brittany

### Intertidal seagrass mapping

- Seagrass percent cover (SPC) in *Z. noltei* dominated meadows
- Based on NDVI
- Applied to S2 images (10 m pixel)

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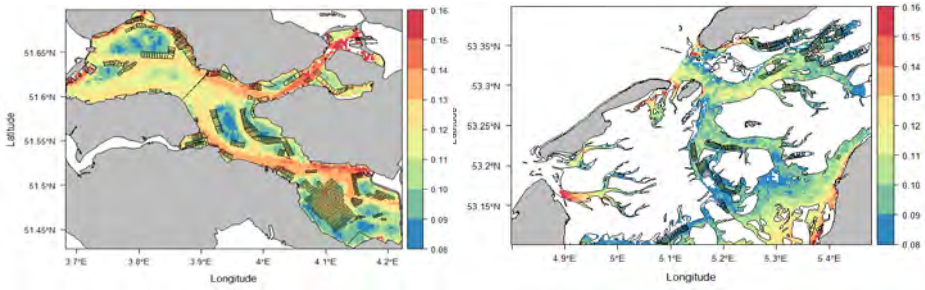
# Coastobs service examples: Dutch coast

## Mussels Growth potential: EO + model

based on main predictors for mussel growth rate in spring for each study area:

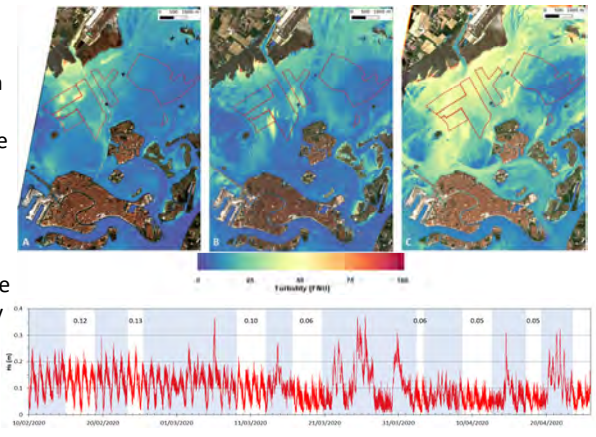



| Study area | Main predictor | Parameter estimate | $R^2$ | p-value |
|---|---|---|---|---|
| Oosterschelde | log Total Suspended Matter | -0.02 | 0.24 | 0.009 |
| | log Food Quality | 0.03 | 0.17 | 0.025 |
| Wadden Sea | log Food Quality | 0.12 | 0.31 | 0.013 |



# Coastobs service examples: Adriatic coast

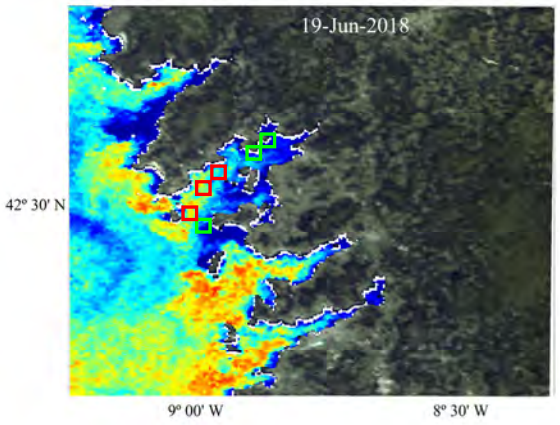
**COVID-19 lockdown measures reveal human impact on water transparency in the Venice Lagoon**
Investigate the seasonal evolution of water transparency in the Venice Lagoon under reduced anthropic pressures.
In situ observations acquired at monitoring stations, specifically designed field activities and the use of modelling tools to quantitatively describe the processes affecting water transparency.



## Coastobs service examples: Galicia

# Validation results

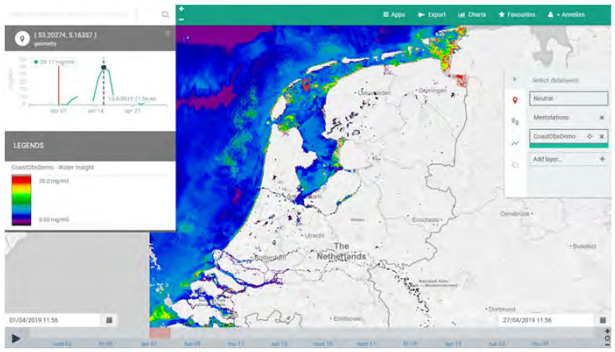
*Pseudo-nitzschia* spp. species indicator




- *no bloom*
- *bloom*



## Web portals (based on Lizard by Neelen & Schuurmans)




https://coastobs.lizard.net
https://eomores.lizard.net

# Take home messages

- EOMORES produced a number of viable and validated services based on EO (mainly Sentinels), continuous in-situ data (WISPstation) and model (Algae radar)
- CoastObs also produced a very user relevant service portfolio based on EO and models and user requests and requirements
- On the technical side it was noted that local services (both inland and coastal) still need quite some fine-tuning in atmospheric correction and algorithm development per location : no one size fits all solution
- WFD applications will establish a real value for water managers but first embedding of EO-based monitoring in the directive itself is required
- Coastal applications show a large commercial promise