CoastObs

INITIAL USER REQUIREMENTS DOCUMENT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776348.

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Author list:

Name	Organisation
Federica Braga	CNR
Vittorio Ernesto Brando	CNR
Andrea Barbanti	CNR
Christian Ferrarin	CNR
Kathrin Poser	WI
Steef Peters	WI
Pierre Gernez	UN
Laurent Barillé	UN
Tony van der Hiele	HZ
Jacob Capelle	HZ
Jesus Torres	UVIGO
Anne-Laure Barillé	BL

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CoastObs Project

CoastObs is an EU H2020 funded project that aims at using satellite remote sensing to monitor coastal water environments and to develop a user-relevant platform that can offer validated products to users including monitoring of seagrass and macroalgae, phytoplankton size classes, primary production, and harmful algae as well as higher level products such as indicators and integration with predictive models.

phytoplankton

seagrass

harmful algal blooms

primary production

To fulfil this mission, we are in dialogue with users from various sectors including dredging companies, aquaculture businesses, national monitoring institutes, among others, in order to create tailored products at highly reduced costs per user that stick to their requirements.

With the synergistic use of Sentinel-3 and Sentinel-2, CoastObs aims at contributing to the sustainability of the Copernicus program and assisting in implementing and further fine-tuning of European Water Quality related directive.

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Partnership

Water Insight BV. (WI)

The University of Stirling (USTIR)

Consiglio Nazionale Delle Ricerche (CNR)

Universite de Nantes (UN)

HZ University of Applied Sciences (HZ)

Universidad de Vigo (UVIGO)

Bio-Littoral (BL)

Geonardo Environmental Technologies Ltd. (GEO)

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ABBREVIATIONS

List of abbreviations	
Abbreviation	**Explanation**
ADB	Autorità di bacino Distrettuale delle Alpi Orientali
ARPA Veneto	Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto
ARVI	Cooperativa de Armadores de Pesca del Puerto de Vigo
BWD	Bathing Water Directive
CA	Consortium Agreement
CDOM	Coloured Dissolved Organic Matter
Chl-a	Chlorophyll-a
CNR	Consiglio Nazionale Delle Ricerche
CRC	Comité Régional de la Conchyliculture
COREPEM	Comité Régional des Pêches Maritimes et des Elevages Marins des Pays de la Loire
DoA	Description of Action
EO	Earth observation
FR	France
FTP	File transfer protocol
GA	Grant Agreement
HAB	Harmful Algal Bloom
IPR	Intellectual property rights
IT	Italy
LoC	Letter of Commitment
MB	Management board
MSFD	Marine Strategy Framework Directive
MSI	MultiSpectral Instrument

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NL	Netherland
OLCI	Ocean and Land Colour Instrument
PC	Phycocyanin
PO	Project officer
PO Mossel	Producentenorganisatie van de Nederlandse Mosselcultuur
PP	Primary production
PFT	Phytoplankton Functional Type
PSC	Phytoplankton Size Class
QA	Quality assurance
REA	Research Executive Agency
RWS	Rijkswaterstaat
S2 or S-2	Sentinel-2
S3 or S-3	Sentinel-3
SLA	Service Level Agreement
SMIDAP	Syndicat Mixte pour le Développement de l'Aquaculture et de la Pêche en Pays de la Loire
SP	Spain
SPM	Suspended Particulate Matter
SST	Sea Surface Temperature
TBD	To Be Defined
TSM	Total Suspended Matter
WFD	Water Framework Directive
WC	Water Colour
WP	Work package
WQ	Water Quality
WT	Water Transparency

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Summary

Tasks objective (from Description of Action):

To define the content and quality requirements (Task 2.2) and the technical and service requirements (Task 2.3) for the CoastObs products and service

Scope of this Document:

The scope of this document is to establish the initial requirements of the users based on the responses to the CoastObs questionnaire.

The CoastObs questionnaire has been set up and sent to the users to assess their needs and requirements. 16 governmental administrations and private companies have responded to the questionnaire from Holland, France, Italy and Spain and their responses are summarised in this document. It is not the intention of this deliverable to provide a detailed analysis of the replies to the questions until a further iteration of the questionnaire after discussions between users and partners. However, there are figures and tables related to how users have answered specific questions from the questionnaire.

On the basis of the responses and the active collaboration with the users, the products and services proposed by CoastObs now have a wide diversity of demonstration cases at most of the representative locations in Europe for testing their products.

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1. Introduction

As this is the first public deliverable for CoastObs, Section 2 provides a summary of the proposed CoastObs approach, Section 3 shows the questionnaire that has been provided for each user to assess their needs and requirements. The figures and tables in Section 4 provide a summary of the response of our users (16 governmental administrations and private companies from Holland, France, Italy and Spain – for five Dutch mussel producers one common questionnaire is provided as their requirements are identical) with some preliminary comment on the requirements.

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2. The CoastObs overall approach

This section provides a summary of the proposed CoastObs approach with excerpts from the GA.

2.1 Product and Service definition

The partners have provided an initial product portfolio based on Table 1, Table 2, and Table 4, on which discussions with the users to elicit user requirements were based. User requirements are grouped into four categories: content requirements, quality requirements, technical requirements and service requirements. The user requirements will feed into a technical implementation plan and a validation plan. The product and service portfolio will be considered as a living document that will be updated at specified points in time during the life time of the project, and will be a useful document for advertising the CoastObs services to a wider user community.

2.1.1 Standard product definition

An initial overview of the standard products is given in Table 1.

Table 1: Initial overview of standard products

Initial overview of standard products			
Parameter	**Source**	**Spatial resolution**	**Temporal resolution (with 2 satellites in orbit)**
Chlorophyll-a concentration	S2	10 – 60 m	10 days (5 days)
	S3 (MERIS)	300m	2-3 days (daily)
	multisensor	1 km	daily
Total Suspended Matter concentration / Turbidity / Transparency (K_d)	S2	10 – 60 m	10 days (5 days)
	Landsat-8	30m	16 days
	S3 (MERIS)	300m	2-3 days (daily)
Yellow substances / CDOM	S3 (MERIS)	300m	2-3 days (daily)
Phycocyanin	S3 (MERIS)	300m	2-3 days (daily)
Sea Surface Temperature	GHRSST	1km	Daily
	Landsat 8	100m	16 days

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2.1.2 Innovative product development

In recent years, research has been under way to exploit the possibilities offered by the Copernicus satellites for the creation of new products, some of which are highly relevant to coastal zone management. Building on the specific expertise of the scientific partners in CoastObs, several of these products (Table 2) will be tested and validated with the aim of progressing from a research topic to an operationally available product. The products phytoplankton size classes, primary production and harmful/indicator algae species make use of the narrow dedicated spectral bands of Sentinel-3 OLCI that resolve the spectral characteristics of water constituents well enough to derive these parameters. The seagrass and sublittoral habitats products will be based mainly on Sentinel-2 MSI, in combination with optical in situ measurements. Also, for sublittoral habitats, tests will be performed with very high resolution multi-spectral images to test the capabilities of these sensors for the detection of the respective parameters. For services that are based on longer time series (spatial suitability analysis, historic analysis), MERIS data will be used in combination with OLCI.

Table 2: Initial overview of innovative products

Initial overview of innovative products			
Parameter	Source	Spatial resolution	Temporal resolution (with 2 satellites in orbit)
Presence and status of Seagrasses and macroalgae	S2	10 – 60 m	10 days (5 days)
	Landsat 8	30 m	16 days
Phytoplankton functional types	S3 (MERIS)	300 m	2-3 days (daily)
Sublittoral habitats	S2	10 m	10 days (5 days)
	VHR sensors	Variable	Variable
Harmful / indicator algae species	S3 (MERIS)	300 m	2-3 days (daily)
Primary productivity	S3 (MERIS)	300 m	2-3 days (daily)

2.1.3 Higher-level product development

In earlier projects, a common mismatch between the products generated and the information needs of the users has been identified as a major factor impeding the take up of Earth observation into operational water management. Bridging this gap is an important activity of the CoastObs project and will require a highly inter-disciplinary approach. Based on the analysis of the users' spatial, temporal and content-level information needs, the basic products will be aggregated into innovative higher-level products. These products can consist

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of (a combination of) spatial and temporal aggregation, classification and integration with additional data and tools, such as growth models for shellfish. Examples of such higher-level products that will be developed and implemented within CoastObs are given in Table 3.

Table 3: Preliminary overview of higher-level products

Preliminary overview of higher-level products			
Product	**Definition**	**Purpose**	**Basic products used**
Phytoplankton bloom phenology	Timing of the onset, length and intensity of phytoplankton blooms	Monitoring of the effects of eutrophication, mitigation measures actions, and climate change, better targeted in situ sampling schemes	Chl-a maps, PP maps, HAB/indicator species maps
WFD indicators	Classification of a water body as having High, Good, Moderate, Poor, or Bad water quality	Simplification of WFD reporting for the user	EO based aggregated data products and maps (Chl-a, PC, transparency), in situ measurements (Chl-a, PC, transparency)
Coastal erosion and accretion monitoring	Trace changes in the shoreline due to erosion and accretion	Support local risk assessment and shoreline management	TSM maps, shoreline maps
Source identification	Trace sources of plankton blooms	Allow the user to take measures to reduce e.g. nutrient influx	Chl-a and turbidity maps
Spatial suitability	Long-term record of spatial distribution of certain WQ parameters	Identify areas that are particularly suitable for a certain type of use (e.g. mussel aquaculture)	Chl-a and TSM maps, PSC, PP, SST

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2.1.4 Service types

A number of different service types are envisioned to fulfil different user needs for water quality data. An overview of the service type is given in Table 4. All products will be delivered in such formats that they fit seamlessly into the users' own data management and information systems.

Table 4: CoastObs service types

CoastObs service types		
Service type	**Characteristics**	**Application examples**
Operational monitoring	Near real-time or seasonal service	Water quality management by authorities or e.g. dredging companies, production monitoring for aquaculture
Environmental reporting	Often annual aggregation, classification and aggregation of data to fit required classification and reporting units	Reporting to fulfil requirements of directives such as the WFD, BWD, MSFD
Spatial suitability analysis	Based on long-term archive data, identify typical spatial patterns	Identifying areas that are particularly suitable for certain type of use (e.g. mussel aquaculture)
Historic analysis	Based on archive data, depending on purpose looking at long-term patterns or specific times/events	Identification of pollution sources for better management, analysis of coastal erosion and accretion patterns, analysis of the impact of construction projects or measures taken to improve water quality

2.2 Demonstration cases

To demonstrate the multi-user approach of CoastObs, a number of case studies have been identified in coastal areas where multiple stake holders have indicated a need for better information on water quality. For these areas, operational services will be set up for the members of the user group according to their product and service requirements. These services will be fully automated and be integrated into the users' operational data management systems. The precise definition of these services will be part of the Service Level Agreements between the consortium partners and the users. The start of the demonstration cases is an opportunity for new users to join the project.

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2.3 Review of the user requirements based on the GA

Based on an initial review of the specific content requirements from the users group based on the GA, a series of questions were identified to further define the content requirements for this project. The questionnaire, described in section 3 was filled in during interactions/meeting with users also eliciting information on technical and service requirements.

Table 5: Review of the specific content requirements from the users group based on the GA

Review of the specific content requirements from the users group based on the GA						
User / Consortium contact	Country	Entity type	Water body	Management question	Parameters according to SLA or LoC	Service type according to SLA or LoC
Rijkswaterstaat (RWS) / WI	NL	National water management authority	Wadden Sea and Ems estuary	Ecological status and trends in water quality	WT, chl-a, TSM, PP, seagrass, HAB	Environmental reporting, historic analysis
Producentenorganisatie van de Nederlandse Mosselcultuur (PO Mossel) / HZ	NL	Mussel industry association	Eastern Scheldt estuary & Wadden Sea	Suitability for mussel production, Environmental effect of mussel farming	WT, TSM, WC, CDOM, WQ indicators, categorized results	Operational monitoring
M en M Padmos + WK Schot + Mosselkweek Steketee-Bom, De Waal Padmos, De Rooij mosselkweek / HZ	NL	Mussel producers	Eastern Scheldt estuary & Wadden Sea	Suitability for mussel production, production monitoring, optimisation production efficiency	Chl-a, TSM, CDOM, PP, PFT/PSC, HAB, categorized results	Spatial suitability analysis, operational monitoring
Syndicat Mixte pour le Développement de l'Aquaculture et de la Pêche	FR	Public regional support structure for Shellfish farming and	Bourgneuf bay, bay of Vilaine	Ecological status and trends in water quality Suitability for	WT, Chl-a, TSM, PP, HAB	Spatial suitability analysis

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en Pays de la Loire (SMIDAP) / UN		Fisheries	and Loire estuary	oyster production		
Comité Régional des Pêches Maritimes et des Elevages Marins des Pays de la Loire (COREPEM) / UN	FR	Fisheries industry association	Loire Estuary (Bourg neuf Bay)	Regulation related to fisheries of bivalve beds, sustainability of bivalve beds fisheries	Seagrass, macro-algae, WQ indicators	Spatial suitability analysis
Comité Régional de la Conchyliculture (CRC) / UN	FR	Shellfish farmer industry association	Loire Estuary (Bourg neuf Bay)	Regulation related to aquaculture, sustainability of aquaculture	TBD	Spatial suitability analysis ALL
French Agency for Biodiversity / BL	FR	National environmental authority	All the French coasts	Environmental protection and prevention: protected species and habitats,	All	Operational monitoring, spatial suitability analysis, historic analysis
Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto (ARPA Veneto) / CNR	IT	Regional environmental authority	Venice Lagoon and northern Adriatic Sea	Environmental protection and prevention: habitats, eutrophication	All	Operational monitoring, spatial suitability analysis, historic analysis
Autorità di bacino Distrettuale delle Alpi Orientali (ADB) / CNR	IT	Regional water management authority	Northern Adriatic Sea coasts	Catchment planning, water resources safeguarding, hydraulic and geological risk control	Turbidity, TSM, coastline	Operational monitoring, Historic analysis
CNR -ISMAR / CNR	IT	Research organization	Venice Lagoon / Northern Adriatic Sea			

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Cooperativa de Armadores de Pesca del Puerto de Vigo (ARVI) / UVIGO	ES	Fisheries industry association	TBD	Fisheries management, stock estimation	WT, Chl-a, TSM, WC, CDOM, PP, PFT/PSC, seagrass and macro-algae, indicators	Operational monitoring, spatial suitability analysis, historic analysis

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3. Initial user requirements questionnaire

The following view is the template of the questionnaire as submitted to the Users.

1 The USER	
Organisation	
End Users Name	
Position of the End User with the organization	
Postal address	
Email	
Telephone	
Type of organisation *	
Brief description of the organisation's activities requiring spatial analyses decision support	
Experience with satellite data, products and processing chains	
Experience with models, data assimilation, etc.	
In situ data availability for validation and products assessment	
Expectation of how CoastObs can improve or support their activities	

** E.g. federal/local governmental administration, industry (aquaculture, infrastructure, engineering company, etc.), national/international NGO, inter-governmental environmental organisation, scientist, etc.*

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A. Initial User requirements

A.1 Content and Quality requirements

2 Geographic area(s) of interest ***(Indicate the areas for which spatial data is required)***		
Area of interest	*Please indicate the geographical area of interest*	
Geographical extension *(Please as far as possible indicated in WGS84, decimals)*	*NW corner*	*NE corner*
	SW corner	*SE corner*

If it is relevant to include more geographical areas please copy the rows above. Please feel free to include a map indication the area(s).

3 Parameters currently monitored						
Parameter	**Method**	**Spatial resolution**	**Temporal frequency**	**Accuracy**	**Motive of monitoring***	**Shortcomings of current monitoring solution**

** R – Reporting requirements, i.e., eu directives, national, regional; M – Management*

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4 Variables currently planned in CoastObs

(select the variable that could be of interest to you)

	Parameter	Spatial resolution [m]	Temporal resolution (with 2 satellites in orbit)	Accuracy expected	Controlled data field campaign Y/N	Note
	Chlorophyll-a concentration	10 – 60	10 days (5 days)			
		300	2-3 days (daily)			
		1000	daily			
	Total Suspended Matter concentration / Turbidity / Transparency (K_d)	10 – 60	10 days (5 days)			
		30	16 days			
		300	2-3 days (daily)			
	Yellow substances / CDOM	300	2-3 days (daily)			
	Phycocyanin	300	2-3 days (daily)			
	Sea Surface Temperature	1000	Daily			
		100	16 days			
	Presence and status of Seagrasses and macroalgae	10 – 60	10 days (5 days)			
		30	16 days			
	Phytoplankton functional types	300	2-3 days (daily)			
	Sublittoral habitats	10	10 days (5 days)			
		Variable (< 10m)	Variable			
	Harmful / indicator algae species	300	2-3 days (daily)			
	Primary productivity	300	2-3 days (daily)			

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	Phytoplankton bloom phenology					
	WFD indicators					
	Coastal erosion and accretion monitoring					
	Source identification					
	Spatial suitability					

5 Controlled data field campaign

Parameter	Method	Spatial resolution	Temporal frequency	Motive of monitoring	Period of monitoring

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A.2 Technical and Service requirements

6 CoastObs service types *(select the service that could be of interest to you)**			
	Service type	**Characteristics**	**Application examples**
	Operational monitoring	Near real-time or seasonal service	Water quality management by authorities or e.g. dredging companies, production monitoring for aquaculture
	Environmental reporting	Often annual aggregation, classification and aggregation of data to fit required classification and reporting units	Reporting to fulfil requirements of directives such as the WFD, BWD, MSFD
	Spatial suitability analysis	Based on long-term archive data, identify typical spatial patterns	Identifying areas that are particularly suitable for certain type of use (e.g. mussel aquaculture)
	Historic analysis	Based on archive data, depending on purpose looking at long-term patterns or specific times/events	Identification of pollution sources for better management, analysis of coastal erosion and accretion patterns, analysis of the impact of construction projects or measures taken to improve water quality

**The service concept and purpose for the service will determine requirements with regard to the service. Please think about Frequency and Timing (e.g. warnings should be in time, historic analysis might only be delivered once a year etc.)*

7 Data formats *(There might be requirements to the format of the data)*		
Are there any data format requirements?		
By your data management system	By national law	Others:
Which formats are preferred?		
Spatial products (e.g. satellite data, derived maps etc)	Raster data, e.g. NetCDF, GeoTiff. If yes, please specify:	

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	Vector data e.g. shapefile, GeoJSON. If yes, please specify:
	Maps as 'figures', e.g. .png. If yes, please specify:
Point data (e.g. in situ data, derived time series etc)	Data files could be .csv, .xls. If yes, please specify:
Derived products	Bulletins or warning (e.g. pdf, email). If yes, please specify:

8 Transmission protocols

(how do you want to receive the products?)

How do you want us to provide you the products?	
via ftp	YES/NO
via e-mail	YES/NO
automatically, via my **data management system**	YES/NO
via a website or portal	YES/NO
other (please specify): ….	YES/NO
Do you have a <u>data management system</u> in place, which is used to store e.g. regular water quality monitoring data?	
If yes, please specify the name of the system	
Would you want the Coast Obs data to feed into this system?	
If yes, can this system work with an API for ingesting data?	
Can your system ingest data using OGC standards (Web Map Service, Web Feature Service, Sensor Observation Service)?	

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Would you want to (also) store the data yourself in your organisations data store, or should your system automatically connect to our data store and extract the data when needed?	
CoastObs will set up a <u>portal / website</u> to show or provide the products to you. The advantage of a portal is that is can have nice visualisation tools: generation of time series, mapping etc. The disadvantage might be that you would have several systems next to each other (your regular monitoring database, the CoastObs portal, maybe other sources)	
Would you be interested in a portal?	yes/no
If yes, what kind of properties should the portal have? (e.g. mapping, time series, uploading own data, downloading products from the portal)	

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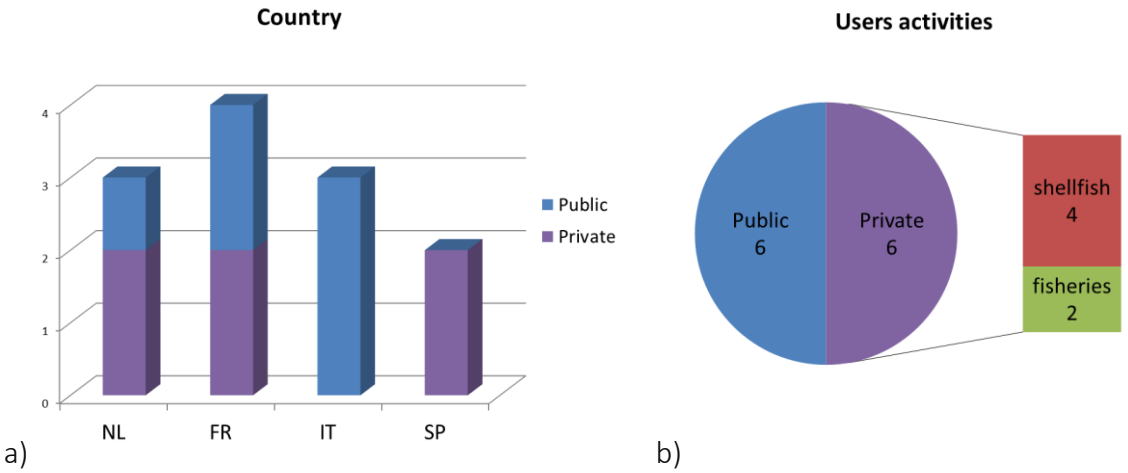
4. Results from questionnaire

4.1 Results

Below are the figures and tables summarising the responses to the CoastObs questionnaire provided by the users during one-to-one interactions/meetings: the text and the units have been left as far as possible in the form provided by the Users.

4.1.1 Specific User Information

The first section of the questionnaire enabled us to describe the users' organizations and identify their working activities and experiences. Furthermore, they expressed their expectations on how CoastObs could improve or support their activities. The results show that both public institutions (national, regional and local) and private companies are interested in CoastObs products and services (Figure 1), with the aim of supporting and strengthening knowledge on some specific aspects currently linked to traditional monitoring activities (Table 6). Their current experiences with satellite (EO) data and products and with numerical models, as well as the availability of in situ data for validation and products assessment are also shown in Figure 2.



a) b)

Figure 1 – a) National distribution of the CoastObs Users and b) their main activities.

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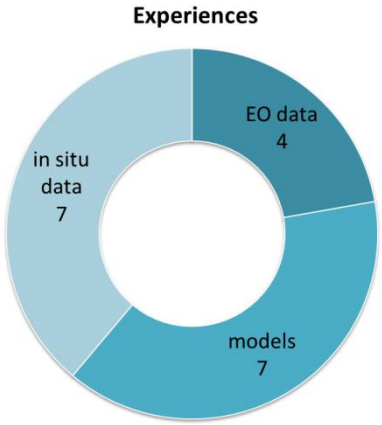

Figure 2 – Users experience with satellite (EO) data and products and with numerical models. The availability of in situ data for validation and products assessment is also shown.

Table 6: List of expectations of how CoastObs can improve or support their activities provided by Users. The areas of interest are also reported.

List of expectations of how CoastObs can improve or support their activities provided by Users		
User	Geographic area of interest	Expectation of how CoastObs can improve or support their activities
Rijkswaterstaat (RWS)	Wadden Sea including ~5km outside the Wadden islands, Eastern and Western Scheldt estuary, The entire Dutch coast	Insight into system dynamics 1. Spatial variability of WQ parameters 2. Temporal variability of WQ parameters 3. Statistics, long term change, anomalies
Producentenorganisatie van de Nederlandse Mosselcultuur (PO Mossel)	Eastern Scheldt estuary & Wadden Sea	Assess effects of environmental activities in and around culture plots. Notably, magnitude of turbidity as a result of dredging fisheries and scale effects of sand nourishment around culture plots.

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M en M Padmos + WK Schot + Mosselkweek Steketee-Bom, De Waal Padmos, De Rooij mosselkweek	Eastern Scheldt estuary & Wadden Sea	Mussel farmers working on production improvement and anticipation of ecosystem dynamics: trough better insight in patterns of food quality and food quantity and in possible contra-productive effects from environment (e.g. effects of sand nourishment) in and around culture plots.
Syndicat Mixte pour le Développement de l'Aquaculture et de la Pêche en Pays de la Loire (SMIDAP)	Bourgneuf bay and Loire estuary	To produce maps of chlorophyll a, SPM, temperature, toxic microalgae to help understanding growth and risks of cultivated bivalves. To obtain water quality indicator for shellfish ecosystem To produce suitability maps to optimize the best locations for growing mussels and to understand mussels mortality events To obtain data about historical analysis of coastal accretion
Comité Régional des Pêches Maritimes et des Elevages Marins des Pays de la Loire (COREPEM)	Bourgneuf bay and Loire estuary	To produce maps of wild oyster reefs/mussel beds for their management for their exploitation by professional To produce maps of macroalgae spatial distribution to monitor the resource collected by professional To produce interannual time-series map of seagrass beds to analyse possible interactions with professional handfishing
French Agency of Biodiversity	Bourgneuf bay and Loire estuary Glenan Island	To get phycocyanin, phytoplankton phenology , chlorophyll-a concentration, and productivity maps for the Glenans and Bourgneuf Bay to better understand the functioning of pelagic food web in relation with the management of basking shark populations. To produce maps of seagrass beds in relation with anthropogenic pressures To produce SPM maps to analyse anthropogenic pressures (e.g. dredging) Would like to count marine mammals in the sea and the stranded ones Would like to count birds In Bourgneuf bay, to get maps of the reefs of honeycomb worm Detailed maps of shores: discriminate species To detect variations of the coastline, tidal flat bathymetry In fact, this agency is interested beyond the two study sites and would be interested to extend it to all Marine Protected Areas of the whole French coastal areas, but also in the French overseas territories

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Comité Régional de la Conchyliculture (CRC)	Bourgneuf bay and Loire estuary	To produce maps of wild oyster reefs/mussel beds that are considered as a resource, but which contribute at the same time to the trophic competition with cultivated conspecifics. To produce maps of macroalgae spatial distribution to help optimize field sampling strategies (when macroalgae are present the biomass of wild oysters is low and known) To produce interannual time-series map of seagrass beds to analyse possible interactions with aquaculture
Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto (ARPA Veneto)	Venice Lagoon and northern Adriatic Sea	Supporting environmental applications such as monitoring water quality, pollution, algal bloom, episodes of anoxia.
Autorità di bacino Distrettuale delle Alpi Orientali (ADB)	Northern Adriatic Sea coasts	Providing raw/processed data from remote sensing and data processing able to strengthen knowledge on some specific aspects currently linked to traditional monitoring only, especially within internal waters. That is: 1. Indicators/indices relevant for drought risk assessment (linked to soil moisture, vegetation stress, ...) 2. Indicators for coastal erosion as impact of reduced sediment transport (due to hydromorphological pressures on internal waters) and as impact of storm surges. 3. indicators/indices linked to quantitative/qualitative parameters describing water flow and - secondly - quantitative/qualitative parameters linked to ecological status (which would be primarily useful to environmental agencies in charge for status classification) Providing data/models/tools to gain information on water scarcity, through the measure of its potential impacts on detectable parameters.
CNR -ISMAR	Mediterranean and Black Seas	Improve the availability of satellite data to be used for model initialization, validation and data assimilation.
Cooperativa de Armadores de Pesca del Puerto de Vigo (ARVI)	Galician coasts	To produce maps of Chlorophyll-a concentration, Sea Surface Temperature and primary productivity for their management for their exploitation by professional.
Consello Regulador do Mexillón de Galicia	Galician coasts	We hope that the data provided by CoastObs will improve the models we are developing in the aforementioned projects.

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4.1.2 Content and Quality requirements

In the Content and Quality requirements section of the questionnaire, the first outcome is the high discrepancy between the parameters currently monitored by the users. In general, public users indicated a large variety of parameters currently monitored on a monthly basis for management and reporting requirements, while private companies are not in charge or did not deal with monitoring activities apart from the elements that relate to the production management and food quality and quantity (sea water temperature, algae toxins shellfish, shellfish density).

The most of the parameters enables public institutions to be compliant with laws and regulations about water quality (i.e. Water Framework Directive, Bathing Water Directive, Marine Strategy Framework Directive, etc.). Moreover, they collect information about water status and environmental conditions properties with traditional methods, based on point measuring sites (in situ measurements and continuous data collection at specific locations, visual investigations, water samples and laboratory analysis) and they are not confident with spatial products and with satellite and aerial derived data.

Only few users provided information on the accuracy expected for the CoastObs variables. Some users' data will be available for controlled data field campaigns (see Table 7).

On the whole, the shortcoming of the current monitoring is perceived to be that it does not sufficiently capture the spatial and temporal variability for real system understanding and monitoring. From their expectations from CoastObs project (Table 6: List of expectations of how CoastObs can improve or support their activities provided by Users. The areas of interest are also reported.Table 6) and their shortcomings of current monitoring solution, it can be deduced that the majority of Users will appreciate to have EO products with spatial and temporal information.

To investigate the usefulness of CoastObs products, we asked the users to select the variables currently planned in CoastObs, which could be of interest for them. We proposed a list of standard and innovative products highly relevant to coastal zone management and offered by the space segment (mainly Copernicus satellites), with different combinations of spatial and temporal resolutions. We proposed also a list with innovative higher-level products, based on a previous analysis of spatial, temporal and content-level information needs. These products can consist of (a combination of) spatial and temporal aggregation, classification and integration with additional data and tools. The results are summarized in the following Figure 3 and Figure 4.

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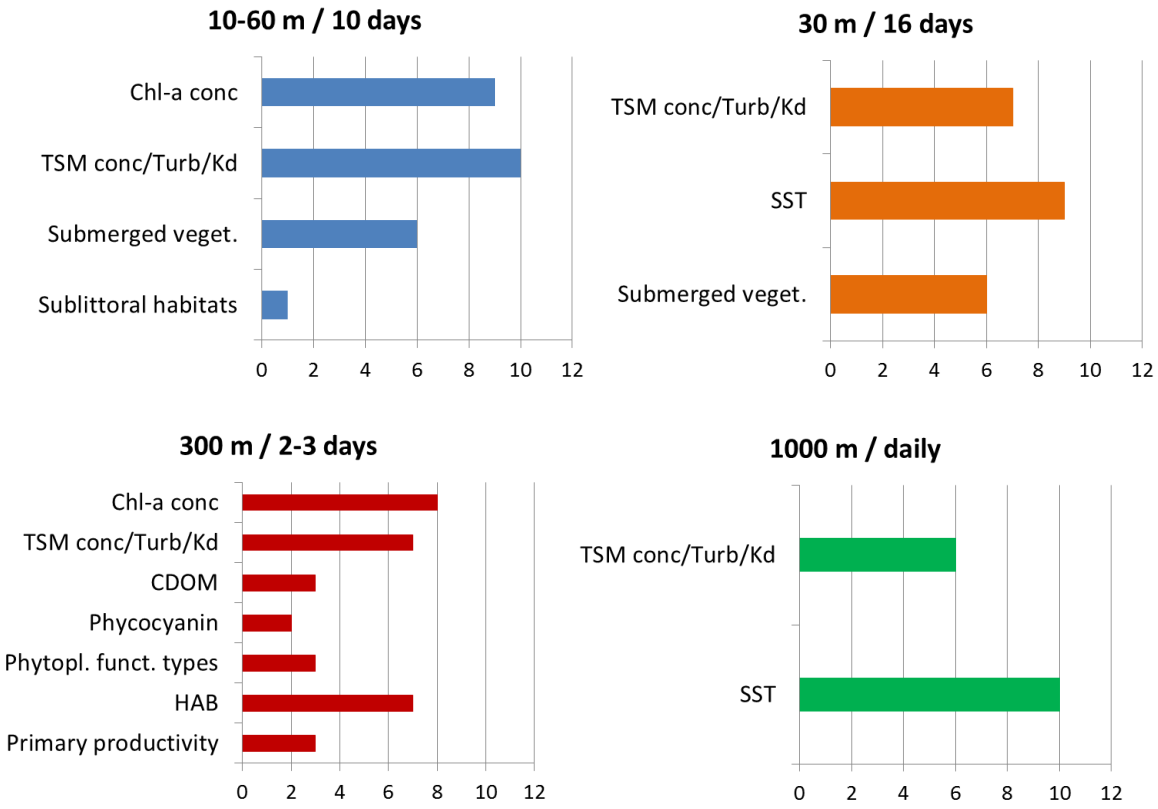

Figure 3 – Standard and innovative products currently planned in CoastObs that Users indicated of interest, divided for different combinations of spatial and temporal resolutions.

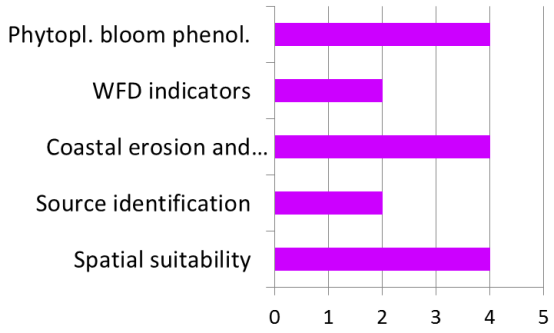

Figure 4 – Higher-level products (see Table 3 for a detailed description) currently planned in CoastObs that Users indicated of interest.

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Table 7: List of parameters available for controlled data field campaigns provided by Users

List of parameters available for controlled data field campaigns provided by Users			
User	Parameter	Method	Area of interest
ARPA Veneto	Chlorophyll-a concentration	Multiparametric Probe	Northern Adriatic sea, Venetian Lagoon, Delta Po Lagoon: Stations uniformly distributed in marine and lagoon water bodies, measured during 7 monthly monitoring campaigns
	Turbidity		
	Sea Surface Temperature		
	Transparency	Secchi disk	
	Chlorophyll-a concentration	laboratory analysis	Northern Adriatic sea, Venetian Lagoon, Delta Po Lagoon: Stations uniformly distributed in the lagoon water bodies and with regard to marine bodies data are available near coast (500m) and in only two offshore sites (4000m) during 7 monthly monitoring campaigns
	Phytoplankton functional types		
	Harmful / indicator algae species		
	Presence and status of Seagrasses and macroalgae	In situ surveys	Venetian Lagoon, Delta Po Lagoon
	Total Suspended Matter concentration	laboratory analysis	Venetian Lagoon
PO Mossel	Turbidity		Continuous data collection turbidity (FTU) by HZ with a temporal resolution of 10 minutes, 8-10 fixed locations.
Dutch Mussel Farms	Chlorophyll-a concentration		Continuous data collection by HZ with a temporal resolution of 10 minutes, 8-10 fixed locations.
	Turbidity		
	Sea Surface Temperature		
	Phytoplankton functional types		Size classes: monthly samples (12 locations in Waddensea, 12 locations in Oosterschelde)
	Additional measurements	Handheld WISP-3	24 locations (Wadden Sea, Oosterschelde), Once a month
Rijkswaterstaat	Chlorophyll-a concentration	laboratory analysis	Several stations, ~ monthly sampling
	Total Suspended Matter concentration		
	Algae species counts		

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	Water temperature	In situ measurement	Several stations, ~ monthly sampling
	Secchi Disk Depth		

4.1.2 Technical and Service requirements

Although the focus in the first period of CoastObs is on developing and validating the products according to the user requirements, the questionnaire also included questions relating to the technical and service requirements. This information will become more important in the operational phase of the project (case studies, starting in the second year of the project). Not surprisingly, at this early stage of the project not all users had a very clear picture of the technical details. Nevertheless, for the more general questions about service types and general service set up, some clear trends emerged. These insights will help the project team to set up the technical infrastructure in a way that is optimised for the most important user requirements.

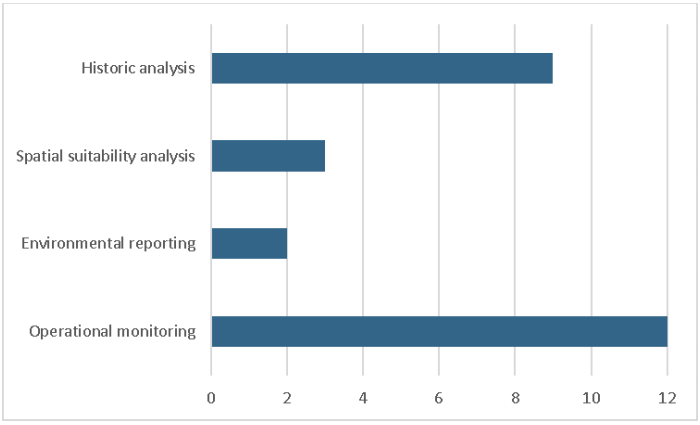

Figure 5 - Number of CoastObs users that requested each of the proposed service types

For the service types, there is a clear preference for operational monitoring (near real time) services; all users indicated an interest in this service type (Figure 5). 75% of the users are also interested in historical analysis. 25% of the users would like to see a spatial suitability service and 17% request an environmental reporting service.

With respect to data formats, few formal requirements (such as national directives or the organisation's internal standards) were reported, but preferences were indicated for commonly-used data formats (most users request GeoTIFF for raster data, ESRI shapefiles for vector data and Excel for point data). 50% of the users are interested in regular bulletins, such as weekly pdf files delivered by e-mail containing an overview of several products.

For the data delivery options, again there is a clear preference: all users are interested in a web portal (Figure 6). A few users would also like data delivery via e-mail (mostly for bulletins)

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or FTP. Only one user favours the idea of the data being automatically delivered to their data management system.

When asked about the features they would like in a web data portal, all users who replied requested a download function (Figure 6). About half of the users would like to see mapping functionality, and almost as many would like to be able to see time series in the web portal. One user also would like to be able to perform statistical analysis in the portal, such as calculating monthly or seasonal averages.

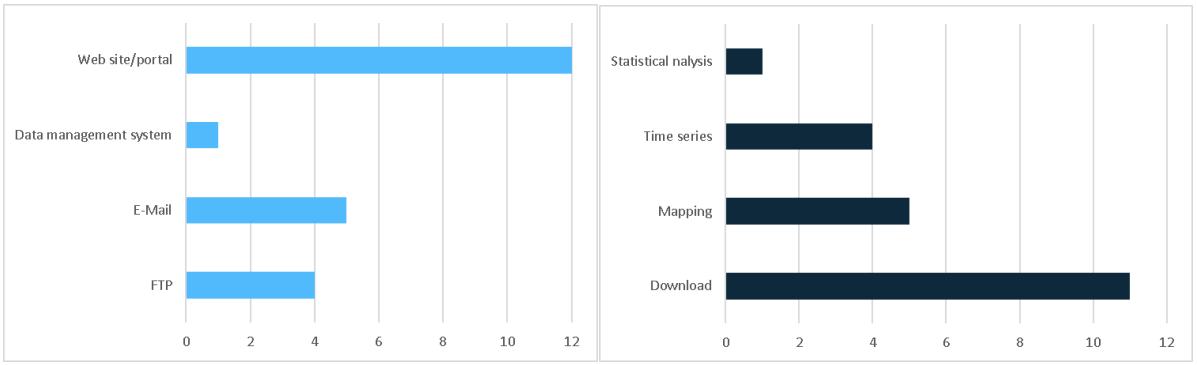

Figure 6 - Number of CoastObs users interested in the different data transmission options (left) and in web portal functionalities (right)

4.2 General Conclusions

The collaboration with the users has been very encouraging, and we have 12 completed questionnaires from 16 governmental administrations and private companies throughout Europe (the five Dutch mussel producers provided one common questionnaire as their requirements are identical). It has been our intention to review the data that we have now and then we will focus discussions with each user which is something that most of them would clearly like. It is important that at this stage of the project, we communicate clearly what is the CoastObs project can or cannot provide.

In a next step, the consortium will review the user requirements and, where necessary, seek clarifications and further discuss with the users individually. Based on the reviewed user requirements, the consortium will develop, implement and validate the products as agreed with the users. After this first development phase, the results will be reviewed and evaluated together with the users, before the requirements for the operational phase will be agreed in service level agreements.

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