HiSea Deliverable 2.1

Report on the Users Feedback

Work Package Number: 2

Work Package Title: User Engagement

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1 Table of Content

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1. Executive Summary

This deliverable D2.1: Initial report on user's feedback, refers to outputs of work done in Task 2.2: End-user's feedback analysis (M1-30). The HiSea project aims to provide a set of services focused on different coastal users' needs and for this reason an end-user centred approach involving the various groups of end-users and stakeholders within and beyond the consortium, is implemented for effective service design and implementation. As planned, a Stakeholder Advisory Board (SAB) including users and experts, was established by the third month of the project. The role of the Stakeholder Advisory Board is to advise the Consortium on the services design, and the development and operation of the information systems highlighting information and user requirements necessary for the specific focus maritime sectors, namely ports and aquaculture.

Specifically, this deliverable summarizes the output of the two Hisea Users' Workshops which were held for the purpose of 1- extensively mapping both port and aquaculture-user's activities, interests, data and information needs as well as 2- informing users about the HiSea service capacities and potential benefits for their activities. At the workshops, information was collected about the challenges faced by ports and aquaculture users in terms of data availability and the provision of information and questionnaires have been distributed in order to:

- identify users' needs and requirements as part of an exercise to co-design the HiSea services for improving operation, planning and management of the ports and aquaculture sectors;
- find out what motivates stakeholders to engage in the HiSea project, as well as the extent and the way they would like to get involved;
- determine which potential barriers stakeholders have experienced or are expecting to encounter;
- highlight the potential added value for ports and aquaculture to gain by adopting the HiSea services.

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2. Establishment of the HiSea Stakeholders Advisory Board

As part of Task 2.1: Establish partnerships with end users, a HiSea Stakeholders Advisory Board (SAB) was established for the purpose of identifying key questions of interest and guiding service development based on the specific needs of these end users. The SAB is composed of experts from both focus maritime sectors, namely: ports and aquaculture. The project's second milestone MS2.1 Establishment of the Stakeholder Advisory Board (SAB), is as such, accomplished successfully.

The goal was to identify end users including industry representatives, other relevant stakeholders and consulting companies, and establish partnerships with them e.g. by inviting them to join the SAB. Together with the consortium partners, their role lies in identifying the critical issues of interest to their sector and establishing protocols baseline positions for current cost and effort required to obtain marine data.

2.1. HiSea Stakeholder Advisory Board for Aquaculture

The end user contribution for Aquaculture for this period came from the partner Selonda. This was more than adequate as Selonda is a leading company in the sector and contribution by adequate number of key staff of the company was ensured. Hence no external stakeholders from aquaculture were invited as additional members of the SAB. However, initiative was taken to present the project in the Copernicus Marine Service for the Aquaculture Sector conference which will take place next September, where input from a wide range of stakeholders can be received. Involvement of other stakeholders will be regularly evaluated and changes can be made accordingly.

2.2. HiSea Stakeholder Advisory Board for Ports

The essence of HiSea's services is that they are designed in close cooperation with end-users and stakeholders in the SAB. The SAB for ports is an external high-level body of experts in the area of Ports, composed of industry representatives and other stakeholders whose role is to collaborate with the HiSea project team and help design and fine tune the unique services. The SAB members will provide advice and cooperate by sharing their experience, participate in workshops and in conference calls to help guide the strategic direction of the services and, in particular, by testing the services and providing valuable feedback which may lead to service improvements.

Note that the SAB members are also potential users of the future HiSea services, which makes them all the more interested in cooperation with the project activities.

The establishment of the SAB started taking place as soon as the project was approved for funding under the H2020 programme. The consortium formally invited a number of potential port users to take part as SAB members, explaining the member's role and duties. Once they agreed to collaborate with the HiSea consortium as SAB members, each signed a formal Letter of Interest (LoI) as proof of commitment.

The SAB for ports is composed of a total of 4 members.

- Port Authority of Valencia;

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- Port Authority of Melilla;
- Port Authority of Piraeus;
- Port Authority of Ravenna.

See Annex 1 for Port Stakeholder Advisory Board Member Letters of Interest (LoI).

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3. State of the Art

Water quality is of paramount importance for both the aquaculture and the port sectors. However, both sectors have distinct priorities and challenges and therefore very different demands. HiSea services are being designed to match diverse and common needs of both the port and aquaculture sectors. As such both types of partners are included and each guide (together with the SAB) development of the HiSea services.

3.1. Ports

The Port Authority of Valencia (PAV) under the trademark of Valenciaport is the public entity responsible for the management of the three State owned ports located along 80 Km of the western Mediterranean coast, named Valencia, Sagunto and Gandía.

Within Valenciaport's Sustainability Strategy exists an environmental status section which focuses on 6 different areas, such as: air, waste, soil, noise, environmental monitoring of works and water. Monitoring and maintaining water quality under control, compliance of regulations and improvement of all port waters are issues considered in daily activities and as such they are current goals set by Valenciaport.

These goals are achieved by carrying out the following ongoing activities:

3.1.1 Monitoring of water quality

Valenciaport carries out frequent studies aiming at checking the water quality in several port areas. These studies are comprised of:

- Monitoring: Hydrology, microbiology, planktonic and benthic communities inside the port throughout an annual cycle.
- Compliance: with the premises according to the regulations which emanated from the 2000/60/CE Directive, known as Water Quality Framework.

Current monitoring is performed by manual sampling and testing.

3.1.2 Cleaning of floating waste from water surface

The Port Authority has a "pelican type" boat, named LIMPIAMAR III, that patrols the port waters on a daily basis collecting all floating waste from the surface. This helps to improve the appearance and quality of port waters.

All waste is then removed and duly managed according to the present regulation.

3.1.3 Fight against pollution caused by hydrocarbon spills

All ports managed under the umbrella of Valenciaport have their own:

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- **Self protecting Plan**
- **Inner Maritime Plan**

Both plans are linked with the individual plans of each of the three ports' facilities, forming a Master Plan.

The Emergency Control Centre (ECC) of the PAV is the one that coordinates all emergencies that occur in any of the ports. This means that in case of an emergency, the ECC coordinates all necessary means to respond to any type of oil spill as well as certain non-spill related accidents and emergency situations.

3.2. Aquaculture

Selonda is one of the leading Mediterranean aquaculture companies, with annual production of 32.000 tons of Sea Bream and Sea Bass. The company operates 55 sea-cage fish farms in Greece with a total annual production capacity of 40.000 tons of Sea Bream and Sea Bass as well as 6 hatcheries in Greece with an annual production capacity of 180 million fry.

The company prioritises water quality for two reasons:

- Water quality is of paramount importance for fish welfare and growth rate. Hence water quality is directly linked with the company's productivity.
- Sustainability and water quality preservation is one of the company's goals. Achievement of this goal directly affects consumers and local communities' perception of aquaculture products.

However, water quality monitoring is time consuming and costly. At the moment parameters like temperature and oxygen are monitored daily but physicochemical analysis for many parameters is done only every few months. Real time or even high frequency data are not available and tools for alerting to changes in water quality are lacking.

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4. Stakeholder Workshops

The HiSea Project held two Stakeholder Workshops on Making Earth Observation Practical, Tangible and Relevant. The aim was to gather information from the ports and aquaculture sectors regarding their needs for sea water quality information which can be provided/ will be obtained from the HiSea Platform.

HiSea is aware of the importance of the interaction with the users and the workshops were another step in establishing the communication channel with the target users. The workshops facilitated the identifications of user requirements, needs and concerns about the HiSea services.

4.1. Ports

The Valenciaport Foundation (VPort), partner of the HiSea project, hosted the project's first workshop at the facilities of the Port Authority of Valencia. The venue consisted of a two-day event starting on the 10th of June, 2019, with an internal HiSea partner meeting related to the project's current activity status which was exclusively for project partners. The workshop was held on the second day, 11th of June 2019, and was the first physical meeting between Advisory Board (AB) members and HiSea technical partners.

The workshop attendees where from a number of different entities such as members of the local Valencian Government (DG Aguas - Generalitat Valenciana), representative from Search and Rescue at Sea (SASEMAR); Advisory board members such as the Port Authority of Melilla and the Port Authority of Valencia; and finally the HiSea partners: Deltares, Hidromod, Ascora, Agora and Valenciaport Foundation.

The workshop's intention was to facilitate the communication between both sides (Partners and none-partners) and engage in a deep discussion with the main object of exchanging relevant information regarding their current activities and issues in matters of water quality management, on behalf of AB members, and HiSea potential services, on behalf of HiSea partners, to define and establish the base-lines for the development of the services to be offered by HiSea for port users. None AB members actively participated in the discussion showing interest and sharing their experiences.

The potential services HiSea intends to provide are very attractive and therefore of high interest to ports and other water quality related areas, as the current information and available data related to water quality has inter alia limited resolution and is difficult to handle. HiSea will provide an intuitive user-friendly platform with higher resolution data based on user needs. As mentioned above, the AB members' role is to provide their knowhow and knowledge, inter alia give advice, to the HiSea partners in order to help design, developed and fine-tune the services offered by the project and this way create a user-based tool for ports.

The main part of the workshop was structured in 2 sessions as follows:

- Demand session: This starting session was intended for the Advisory Board members to explain to the HiSea partners their current situation and detail any issues related to water quality management. This enabled the project partners to get to know and further understand how HiSea would fit into the daily port water management activities. For this session, each member was asked to prepare a brief presentation explaining

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each of their individual and unique situations based on their expertise and knowledge of their port's procedures, facilities and activities related to water quality management.

Additionally, in this first session, a questionnaire was prepared and handed out to the advisory board members. The same questionnaire was also handed out to other attendees such as SASEMAR and the members of the local government. The questionnaire is detailed and analysed in the following section.

- Supply & Demand session: Initially two separate sessions were envisioned but these were merged into one to create a friendlier and more active conversation flow between both sides (user/partner), achieving a higher level of participation and communication among the attendees.

  This session started with a brief presentation from the project's technical partners. They began by introducing HiSea to familiarize all attendees with the project and position them in the context of the project aims. This was followed by a number of presentations by HiSea partners which were prepared for a non-technical audience (appropriate for the end user attendees). The presentations defined and presented examples of the possible services so the SAB members and other attendees could understand and obtain a wider scope of HiSea's potential.

4.1.1 Questionnaire

This section explains the use and objective of the questionnaire which was distributed during the workshop.

The questionnaire will serve to provide additional information beyond what was retrieved from the workshop interactive sessions. As mentioned in the previous section, the questionnaire was handed out to the attendees at the end of the demand session. Participants were allowed 15 minutes to read through, ask any questions and complete the questionnaire prior continuing with the agenda.

Questionnaire

The questionnaire was structures in a specific manner in order for the HiSea partners to obtain a complete view of each of the organisations' profiles, data uses, current barriers and future needs. It consisted of a brief introduction and a description of its objectives followed by a total of 16 questions grouped into 3 types:

- Organisation related questions: focused on obtaining a small insight of each the organizations' activity profiles and interests.
- Technical related questions: focused on obtaining information on current sources and scope of marine data used. Also, to identify existing difficulties and possible needs.
- General questions: related to expectations form HiSea and availability for future involvement.

The answers to the following questions have served as a basis for the analysis of user requirements.

Organisation Related Questions

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1. On which level do you generally operate (local, national, regional, international)?
2. Brief description of current activities
3. Which topics are of interest to you?
4. Brief description of prospective activities and opportunities

Technical related questions

5. To what extent does your organization use marine data?
6. What marine data are you using (e.g. in site measurements, Copernicus products etc.)
7. To what extent would your organization like to use marine data?
8. Would you be able to provide us with resources/data you are currently using?
9. Which barriers/issues did you encounter in using marine data (i.e. temporal resolution, files format, etc.)?
10. Does your organization use models? (Hydrodynamic prediction models or water quality…) If yes, which models do you use and to what extent?
11. Have you already identified tools that you would like to use?

General Questions

12. What benefit can the HiSea platform bring to you?
13. Which barriers do you think you might encounter in using the HiSea platform (time constrain, personnel limitation, etc.)?
14. What type of support would you mostly need?
15. How would you prefer to be involved in the HiSea project (i.e regular workshops, video conferences, etc.)?
16. Would a representative of your organization be prepared to participate in a community of practice for ports?

Questionnaire analysis

This section encloses an analysis of the previous questions based on the responses of the workshop attendees. The analysis is structured in three parts, one for each group of questions and an additional section for general conclusions.

Note that the results obtained are bases on the number of answers given in each questionnaire. Some questions have more than one answer from the same respondent.

ORGANISATION RELATED QUESTIONS ANALYSIS

First of all, and in relation to the Organisation related questions, there have been three types of profiles identified based on the type of activity carried out by the organisations who attended the workshop and fulfilled in the questionnaire. These profiles are:

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- Port management: Activities focused mainly on sheltered waters in port areas. Although some activities can be carried out or related to external areas to the port.
- Search, rescue and fight against pollution: Activities focused on inner and outer port waters.
- Regional coastal water management: Activities focused mainly on coastal waters. Although activities can be related to sheltered port waters, all within regional areas.

The distribution of these profiles is represented in the following chart:

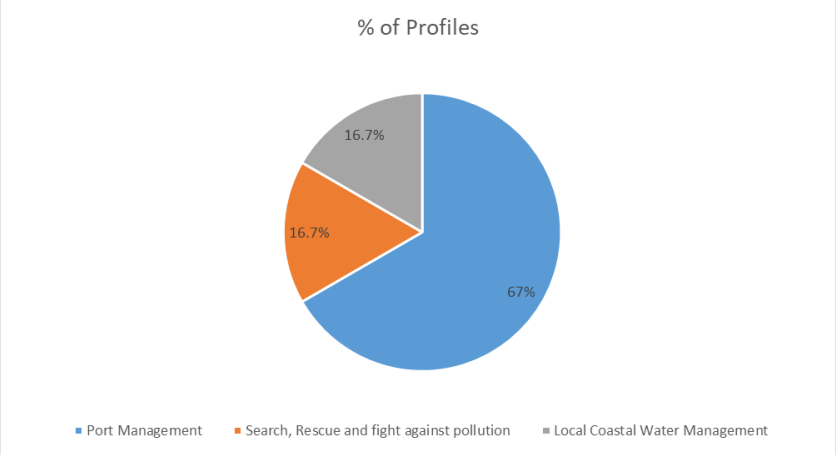

Chart 1: Questionnaire profile distribution

Based on the respondents' initial interests, Ports and Regional water management profiles seem to focus their main interests on **environmental management such as water quality monitoring and measuring**, whereas the minor part is interested in **high resolution satellite image analysis**, corresponding to a search and rescue profile.

Other topics of interest are listed below:

- Emergency early warning system
- Area control and monitoring:
    - Surface (objects, spills) and underwater (sediments, bathymetry)
    - Internal and external to port area
- Water quality parameter validation method verified by EU

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- Continuous methods for water quality parameter validation
- Reduce pollution
- Improve safety

TECHNICAL QUESTIONS ANALYSIS

This second analysis focuses on the more technical aspects of marine data.

71% of answers show that marine data provided by in-situ type measurements is the most commonly used by the respondents' organisations. This data is mainly gathered for carrying out water quality controls of specific parameters. These correspond to port and coastal water management profiles. Neither of these profiles are using any type of modelling.

On the other hand, 14% are using products such as COPERNICUS, NOAA and their own on-site products to predict the trajectories of objects and chemical spills to fight against pollution. According to the results, these are also using specific models, such as: SARMAP[1], OLIMAP[2] and self-built models. The remaining 14% of answers reveal the use of less complex on-line platforms.

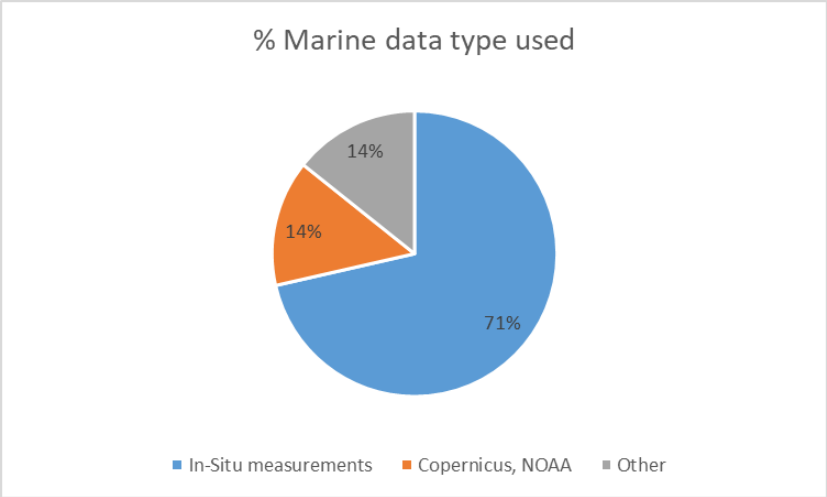

Chart 2: distribution of marine data type used

To which extent marine data is used by the organisations varies depending on their type of activity. From analysis of parameters to comply with current regulations, to in some cases, benchmarking water quality of a specific area and estimating the impact port activities have on surrounding waters.

[1] http://www.sarmap.ch/page.php?page=sarscape
[2] http://www.orbisltd.com/oil-spill-modelling-(oilmap).html

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Others use the data for predicting water trajectories of threatening objects and/or chemical spills, and would like to continue using this same data in more advanced modelling.

Results seem to show a common need between port users, related to how they would like to use marine data. These are to facilitate:

- regulation compliance;
- monitoring of environmental impacts caused by port development;
- water monitoring to reduce pollution.

In some cases, respondents confirm that their organization will be able to provide the HiSea team with marine data (33%). 17% will not be able to provide data and the rest will most lightly be able to provide prior the corresponding authorisation.

Most respondents agree that the existing barriers, when it comes to use of marine data, relate to data being inaccurate as well as difficult to access and handle; there is no reliable real-time data and, analytic methods are limited. In some cases, costs, file formats and temporal resolution of the data can also result as a problem for potential users.

50% of the respondents have not identified any tools they wish to use, whereas the rest show that they would like to use water quality management tools for different reasons, such as:

- Water quality forecasting;
- oil spills identification;
- Water trajectory modelling;
- Water parameter measuring and monitoring.

GENERAL QUESTIONS ANALYSIS

According to the results, the possible benefits HiSea can provide the attendees who fulfilled the questionnaire are listed below:

- Facilitate regulation compliance: e.g. Water Framework Directive
- Availability of continuous water measurements
- Historical data

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- Facilitate knowledge and exchange of best practices
- More advanced and precise models

The results on possible barriers incurred with HiSea show diverse opinions. 50% require more information regarding the project and of the platform to be able to provide a valid answer. Among the rest of answers leads personnel and cost constraints followed by time constraints.

Finally, answers reveal that all representative would be willing to attend regular workshops, of which 50% would also attend video conferences. 50% of the respondents approve of cooperating in a community of practice for ports whereas 25% must consult with their organisation's responsible and the remaining 25% did not provide an answer.

Conclusions

Interests, main concerns and issues have all been included in a table format in order to be able to obtain a global view of the initial feedback. This information will serve as a starter point for the project's team to start designing the services. As the services evolve, SAB members will be informed with updates for the HiSea Team to gather continuous feedback from them in order to fine tune the services.

In conclusion to the analyses of the previous groups of questions, we can assume that organisations that carry out different activities, clearly prioritise diverse needs, and therefore different services could benefit different users at different levels. Diverse profiles are important to consider as each of their activities require specific needs and considerations, and should be analysed to gather a wider scope of potential user needs.

It is early to be able to confirm which are or would be the ideal services to developed under the scope of the project. Although, there is a clear need for water management and monitoring of parameters for most types of users.

The following table shows the main information obtained from the questionnaires:

Table 1 Main information obtained from the questionnaire

Organizational questions: **Topics of interest**	**Technical Questions:** **Marine data**	**General Questions:** **HiSea benefits for users**
Water quality monitoring and measuring	Clearly a dominant use of In-situ measurements. Hardly any use of marine data provided from other sources.	Facilitate regulation compliance: • Water Framework Directive • ROM 5.1.13 • Others

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High resolution satellite image analysis	Common need for marine data use: • Facilitate regulation compliance • Estimating the impact, a port's activities has on surrounding waters (internal and external to port) • Facilitate water monitoring to reduce pollution	Continuous water measurements
Emergency early warning system	Other needs and uses: • Predicting water trajectories (for predicting oil spill trajectories) • Early warning system (for oil spills). This is a priority for a specific user although it would clearly benefit all ports.	• Historical data
Area control and monitoring: • Surface (objects, spills) and underwater (sediments, bathymetry) • Internal and external to port area	Existing Barriers with marine data: • Elevated cost • Inaccurate and no Real-Time data • Difficult access • Difficult to handle • Software and file format incompatibilities	• Provide knowledge and exchange of best practices
EU verified validation method (water quality parameters)		• Provide more advanced and precise models
Continuous water quality measurements		

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Reduce pollution		
Improve safety		

An additional positive outcome is that most attendees showed an interest in the projects topic and are willing to contribute in future workshops and video conferences as well as providing marine data as far as possible, in order to help with the project development.

Note that these conclusions are based on the first interaction with the users and their initial feedback and will be complemented with additional information and user feedback during the course of the project.

4.1.2 User requirements

In this section a first description of potential user needs based on the feedback gathered from the workshop held in Valencia is provided. This information is in relation to that extracted from the questionnaires and therefore may seem repetitive.

It is important to point out that each individual port is unique with its own specific characteristics, making it a difficult challenge to englobe all of ports needs in HiSea's services. User feedback is provided based on their own specific needs and experience; what may seem as a priority benefit for one user may not be for others. Although, most services will be of use to all ports either with a higher or lower priority.

The existing barriers related to available marine data has partly served as motivation to research and develop new tools and ways of treating this data, as the existing ones are proven less attractive for use to potential users. These barriers, as shown in *table 1*, are:

- Elevated costs;
- Unreliable data;
- No Real-Time data;
- Difficult access;
- Difficult to handle;
- Software and file format incompatibilities.

Attending the **existing barriers**, and in order to fulfil these existing gaps, the Service/Tool development must take into consideration the following aspect in relation to:

Marine data:

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- Reliable;
- Accessible and easy to handle;
- Available historical data;
- Compatible format;
- Real-Time data.

Interface:

- User-friendly platform.

All attendees show a clear concern to reduce pollution and therefore an interest in services that may help facilitate this action. In this sense, and considering that water quality is a must for all ports in order to comply with water quality regulations, then the services must partly focus on being able to feed this type of user need.

One Attendees pointed out the need of being able to achieve external port data other than from their own limited port area and the importance of being able to monitor the water quality of these areas. This is due to the fact that in many occasions, port waters can show abnormal behaviour in terms of water quality parameters, provoked by an external source located in outer port waters where they in-situ measurements are not taken by ports for legal reasons. Therefore, being able to obtain marine data from inaccessible areas is required in some cases as inner port water quality can be dependent on outer port water quality.

A new issue will be expected from the 1st of January 2020. All vessels will be forced to use low sulphur fuels or other alternatives to comply with the International Maritime Organisation (IMO) regulations regarding low sulphur emissions. One of the foreseen alternatives is the use of scrubbers, this alternative entails to a new problem which is that although they comply the emission issue they discharge contaminated water, that has previously been used to filter the ships emissions, into port waters. Therefore, new measures will have to be implemented in order to mitigate this problem. For sure, ports will have to monitor these new parameters (PH, turbidity, CxHx and metals) as there will be a clear increase effecting water quality. For example, a challenging case will be controlling the amount of metals that are discharged into ports from scrubber waters as there is no established limit of this parameter and currently no way to control how much metals are being introduced into the water.

Attending **user interests and specific needs**, the first phase of Service/Tool development and design, must consider the possibility of providing the following:

- Area control and monitoring:
    - Water quality

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        - Facilitate regulation compliance
        - Continuous measurements
        - Identify areas with specific water parameters.
    - Internal and external port waters
    - Surface and underwater
    - Continuous measurements
    - Material transport (sediments)
- Early warning systems:
    - Identify oil spills
    - Personalize alarms for abnormal water quality parameters
- Modelling:
    - Water trajectory models: to foresee oil spill movements and others
    - Identify location of contaminating sources
- Forecasting: Water quality parameters

There are many different uses for the services provided by HiSea. These have not all been included as they can be related to some of the above. For example, some port activities consist of promoting the growth of endangered species. For this, specific areas with specific water parameters must be identified in order to promote the growth adequately and effectively. The identification of these parameters would be a task for the HiSea services and would be included in the above section of area control and monitoring.

Being able to have at the touch of a button an intuitive and easy to handle tool that will provide more precise data than what is currently available is extremely attractive for users, especially if it will help them save time, costs and comply with regulations.

HiSea's success is the success of the services for the users' benefits.

4.2. Aquaculture

Selonda hosted the workshop aimed at the aquaculture sector, that was held on June 27-28, 2019 in Greece. The agenda included a guided visit to one of Selonda's hatcheries and fish farms in Larymna during the first day. During the second day a meeting took place at Selonda's headquarters in Athens.

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Participants included representatives from Deltares, Argans-F, Hidromod, Ascora and Valencia Port. Additionally the Chief Production Officer, the Hatcheries' Division Manager, the Head of the ichthyopathology, the R&D coordinator, the head of the on-growing division and the area managers of the fish farms of Selonda attended the meeting. The workshop aimed to bring together end users and stakeholder to work on making Earth Observation Practical, Tangible and Relevant. For this reason, the workshop targeted two goals:

- For the stakeholder to familiarise themselves with the aquaculture way of productions and everyday routine, the challenges and opportunities for HiSea. This was done through visit to Selonda's facilities and discussions with the managers and employees of the site during the first day. It was then followed by the second's day meeting.

- For the key persons of Selonda to get to know what HiSea has to offer and share what is needed.

The second day' meeting comprised of a supply and a demand session. After an introduction to the HiSea project, the service providers introduced the tools and solutions that could be offered. The presentations gave the opportunities to the users to gain a better understanding of what HiSea has to offer and to see examples of relevant to the aquaculture sector applications of the Earth Observation data. Argans-F presented examples of Aquaculture tailored applications and a demonstration of a 'mini website' that was designed on Selonda;s sites. More details can be found in section 5.1. The first session opened the floor for a fruitful discussion on how Selonda's needs and priorities match with the potential HiSea services. The demand session that followed gave an insight of the challenges the aquaculture sector faces and the up to date priorities for the water quality monitoring.

4.2.1 User Requirements

The aquaculture-user requirements were better identified during the workshop. Those requirements can be addressed by the HiSea project, such as:

- need for high resolution data, real time and historical data, forecasting and alerts for oxygen concentration and temperature in the water column. Oxygen and temperature are indeed two of the main parameters that affect fish health, robustness, growth rate and feeding. Increased water temperatures result in higher fish growth rate and feed intake. The ability of the farmers to adjust the feeding when water temperature levels rise results in improved growth and financial benefits. Also, when temperature drops it is important to reduce feeding to avoid feed waste and financial loses. Temperature rise and low oxygen levels are many times linked to fish disease outbreaks.

- Many other parameters such as currents and winds are vital for the sea farm production. Those parameters are not currently monitored by the farmers. Currents and winds can affect oxygen levels that are often more favourable for the fish when currents are stronger. Also winds and currents determine the timing of harvesting using vessels. Forecasting winds and currents would allow to schedule the harvesting so that the weather conditions would not affect the supply chain. However, there is scope to prioritise and decide how many and which parameters can be realistically monitored.

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- The operation of fish farms as aquaculture parks that cover very large areas will become obligatory by law in the next years. The licensing of those parks will demand water quality monitoring of more parameters and of higher frequency. HiSea services can provide the aquaculture sector with what will be needed.
- Indexes that incorporate biomass, temperature, oxygen etc could also be provided by HiSea so that aquaculture companies use them for site capacity. Those indexes are required by the sea farmers for sea farm licensing.
- Water quality monitoring is required not only for sea farms but also hatcheries that pump water from the sea. Especially because fish larvae are very sensitive to water quality issues.

The workshop identified the following immediate actions:

- Provide the end users a full list of relevant parameters provided by Copernicus or modelling.
- Identify which of these parameters are monitored by the end users and the frequency of monitoring. End users to finalise the top priorities parameters and decide which of them can be monitored daily or every second day for the needs of HiSea.
- End users to decide on the pilot sites. The decision will be based on a new monitoring scheme that will be used in the following months by the company. At least 2 pilot sites to be chosen. One of them could be a hatchery.
- Skype for the operational forecasting system: discussion on spatial and temporal resolution, etc.

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5. HiSea Added Value

The sea is crucial for the European transport business, for Europe's competitiveness, and offers a huge potential for job creation and investment. In fact, the EU is highly dependent on sea transport and seaports for trade with the rest of the world and within its Internal Market.

The sea economy has a direct effect on many other economic sectors (e.g. transport, environment, climate change) and for this reason European policy and decision makers include sea related subjects in the domains of interest. In particular, the public support for the increase of Short Sea Shipping across Europe may induce a modal shift from road transport. The latter is still overwhelmingly the most important freight transport mode in the EU.

The proposed HiSea service promises a beneficial economic impact as it contributes to increase the safety and to optimize shipping routes and access to ports. The aquaculture sector can also benefit financially as intensive aquaculture relies on water quality for increased survival rates and growth of the fish as well as better site selection which will result in substantial financial benefit. As a by-product, the results can also provide benefits in what concerns oil spills (by providing effective hydrodynamic forecasts which simulate in real time the probable fate of an identified oil spill).

Also, the so-called Blue Economy concept is taken into account. The sea storms are responsible for a multitude of incidents in the seas and their forecast or early warning is certainly a step forward for the protection of the EU maritime environment.

HiSea service will contribute in an effective way to a progressive increase of the effective use of existing Copernicus Marine Services which will be employed in practice in improve benefits for the society in terms of safety and environmental protection. Key features include: (i) integrating existing datasets into this easily-accessible and user-friendly service, (ii) improving spatial and temporal observation and modelling resolution through regional high resolution models whenever they may be available, (iii) fostering the coastal assessments and forecasts providing a deeper understanding of vulnerability, risks and interventions at local and regional levels, (iv) involving end-users and expanding the visibility and operability of the service. As a result, HiSea:

- Contributes to establish sustainable supply chains for innovative EO value added products and services with demonstrated commercial value with targeted client communities;

- creates new market opportunities and boosts business activity;

- provides qualified data to improve the predictive capacity of model products and improve the cost effectiveness of data collection in support of sea-related industrial and societal activities;

- leads to a sustainable service capable of generating a sustainable turnover and, by this way, creating new jobs and assuring the maintenance of the service beyond the ending of the funding.

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HiSea delivered information has an intrinsic economic value because it allows individuals to make choices that yield higher expected payoffs or expected utility than they would obtain from choices made in the absence of it. The wider availability of sea data also brings other direct benefits such as the time savings in acquiring such data. Obviously, time-savings lead to financial and economic returns.

Till recently these types of services were only offered by large institutions which could afford large computational infrastructures and the cost of the communication requirements. With the advent of cloud computing and the dissemination of the access through large bandwidth communications at affordable prices it is possible for smaller institutions to offer similar services. The elasticity of the cloud enables adjustment of the resources to match the demand and in this way avoids the need for high initial investments in infrastructure.

This is a major factor in the business sustainability and achieving the potential impact of these services in the addressed markets. By contributing to "democratize" the use of the provided information and having the capability to keep the service running in the long term it will certainly contribute to the appearance of new similar services promoted by a natural increase in the demand.

5.1. Services [Argans-F]

5.1.1 Monitoring environmental parameter

Different "mini websites" have been designed and operated by Argans-F on Selonda sites, Portugal sites (currently studied by Hidromod) and the Valencia port to monitor the environmental parameters with Earth Observation (EO) data from remote sensing and model outputs from CMEMS/Copernicus).

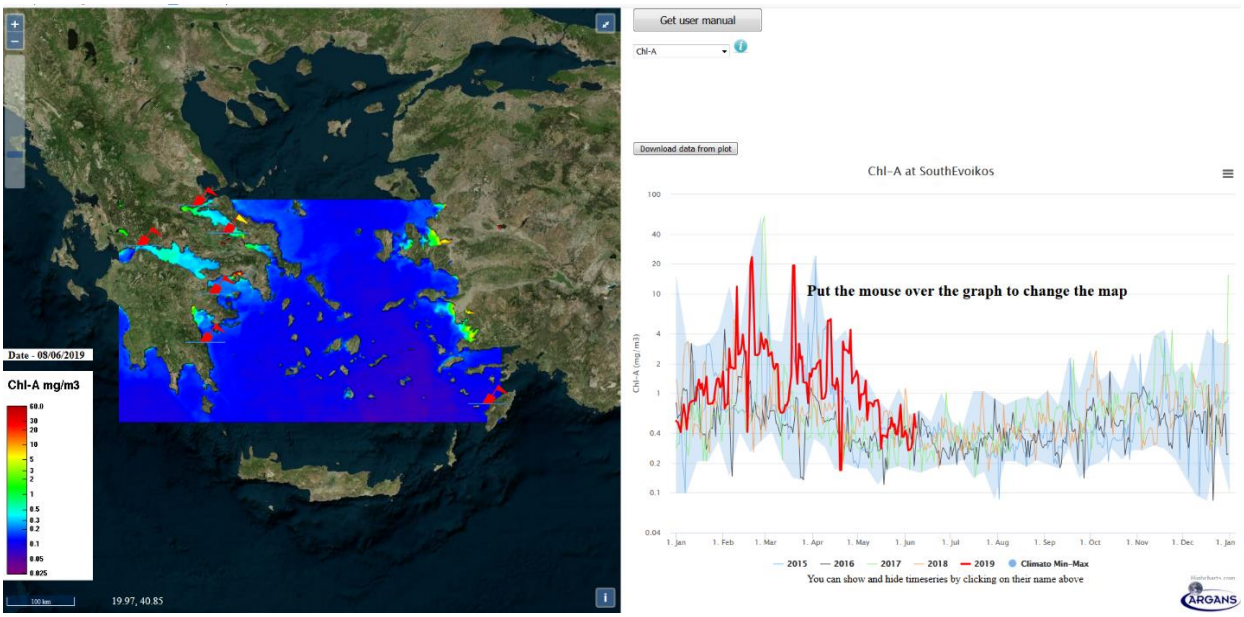

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Figure 1: Selonda mini website – Chlorophyll-a from level 4 CMEMS products at a resolution of 1km.

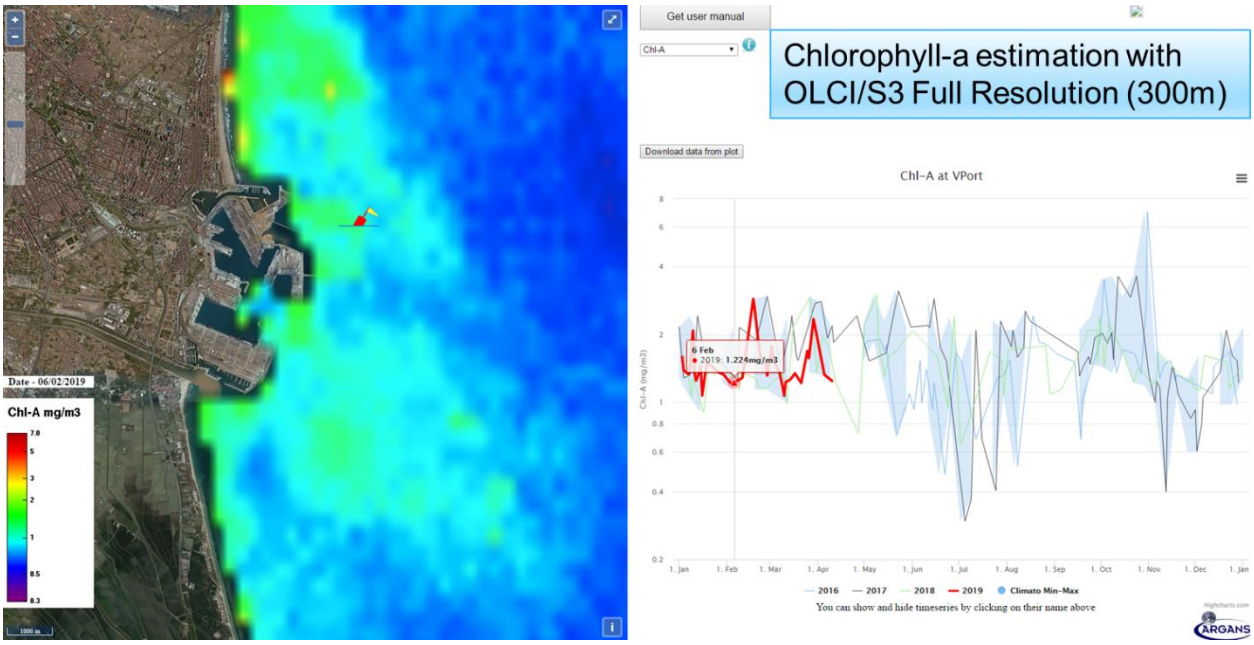

Figure 2: V-Port mini website – Chlorophyll-a from OLCI/S3 at a resolution of 300m.

Medium resolution data provided by Argans-F via those sites are the following ones:

List of Parameters that could be supplied

Remote Sensing (NRT):

- Chlorophyll-α
- Harmful Algal Blooms
- Turbidity
- Suspended matter
- Sea Surface Temperature
- Transparency
- Wind
- Others? (cdom, POC, DOC…)

Model Outputs (forecast):

- Salinity
- Oxygen
- Currents
- Waves
- Sea Surface Temperature
- Chlorophyll-α
- Suspended matter
- Others?

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*Figure 3: List of parameters provided by Argans-F at **medium resolution***

For aquaculture and port monitoring the positive and negative points of the EO at medium resolution are summarised in the following table:

*Table 2: Positive and negative points for available EO **medium resolution**.*

POSITIVE	NEGATIVE
Repetitiveness	Spatial resolution >=300 not necessarily adapted
Spatial coverage	Depend on cloud coverage for remote sensing data at a level less than level 4.
Daily images for remote sensing Hourly output for models	
Number of available parameters	

Some satellite data provides **a higher spatial resolution (HR ~ 10m)** that could be interesting in monitoring ports and aquaculture sites. Those data provide from Sentinel-2 and sentinel-1 ESA/Copernicus satellites. The following figure shows a Sentinel-2 RGB image of the Valencia port and the suspended matter estimated with the algorithm of Han et al. (2016).

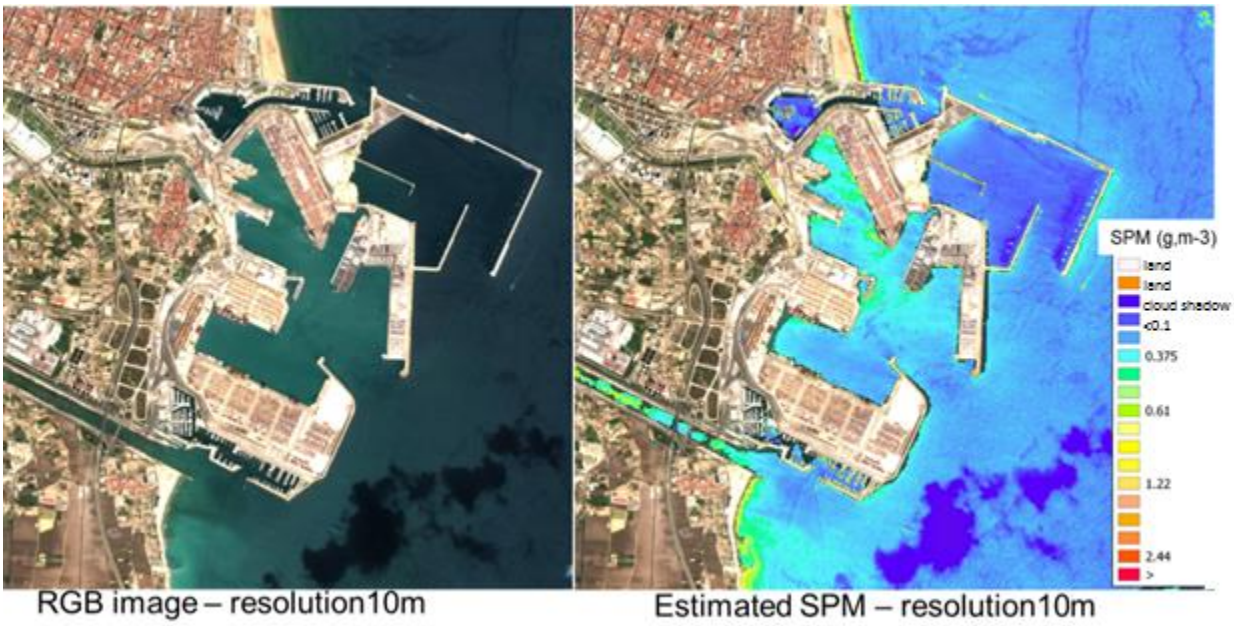

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*Figure 4: Valencia port- Sentinel-2 RGB image (left) and SPM estimation (right) – from **High Resolution** imagery*

Moreover, Argans-F can provide floating object detection index, developed in an ESA project (EO tracking of marine debris in the Mediterranean Sea – 2018/10 to 2019/10), that could be interesting for port management and farm security. The following figure shows floating debris offshore Sicily detected with Marine Litter Processor developed by Argans-F in the frame of this project with High Resolution imagery.

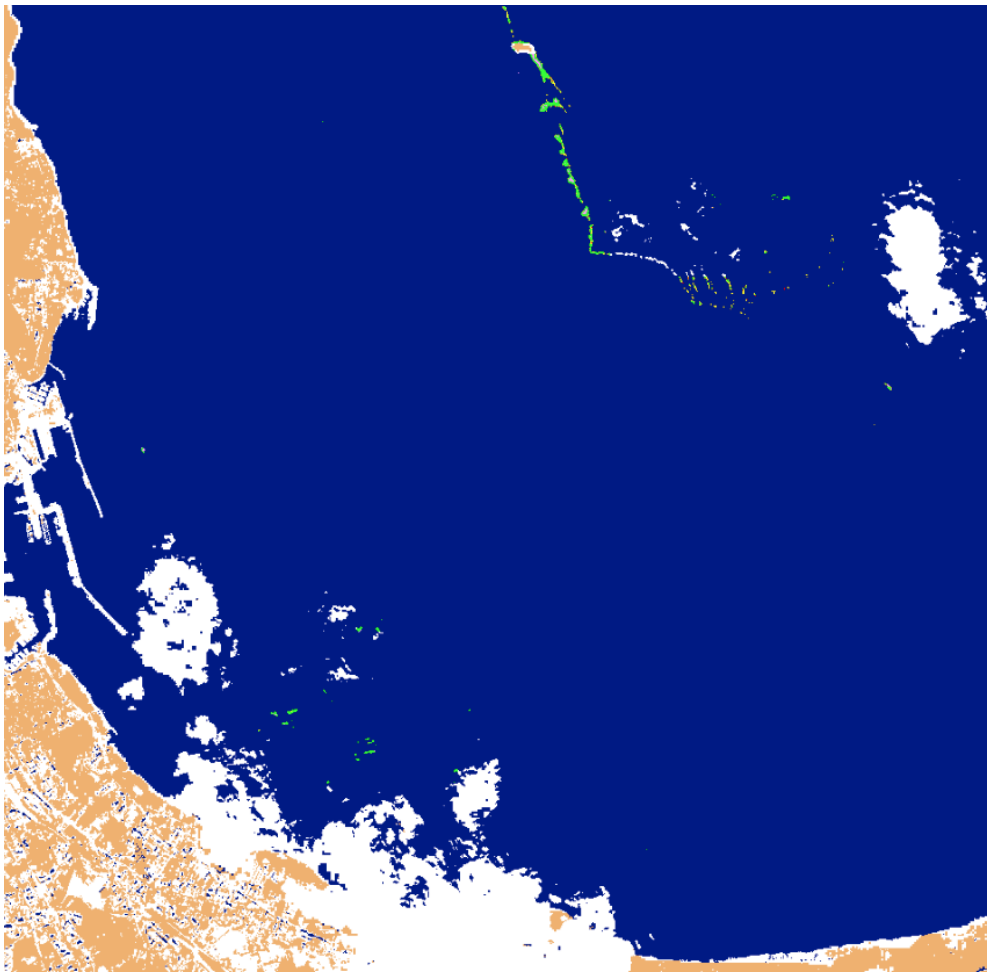

Figure 5: Floating debris detection (green, yellow and red) with Sentinel-2 Argans "ML Processor"

For aquaculture and port monitoring the positive and negative points of the **High Resolution** satellite imagery are summarised in the following table:

Table 3: Positive and negative points for High resolution remote sensing data.

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POSITIVE	NEGATIVE
Resolution 10m well adapted for ports and farm dimensions	Repetitiveness/coverage: 1 image every 5 days
Floating objects detection (litter, vegetation, boat, debris)	Number of available parameters are limited: Turbidity and local chlorophyll-a algorithms
	Depend on cloud coverage

The use of **Sentinel-1** (radar: resolution < 10 and not submitted to cloud coverage) can also provide interesting information on **pollution** (i.e. oil spill detection) and **boat detection**. The following image is an example of oil spill detection in the Bay of Biscay after a sinking of a boat.

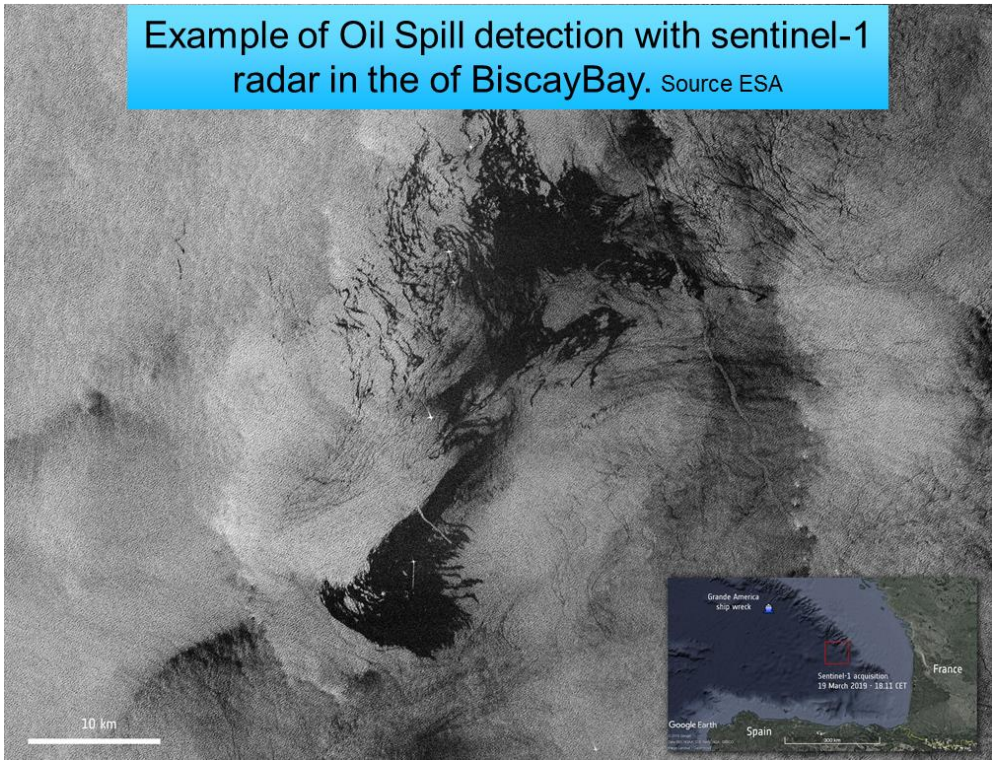

Figure 6: Oil spill detection with Sentinel-1 satellite.

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Figure 7: Boat detection in Greece (Saronikos) with Sentinel-1 satellite

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5.1.2 SAFI Web-GIS:

This service provides a water quality monitoring on user defined area of interest. Available parameters are the remotes sensing ones describes in the previous chapter. The following image show the available services provides by the SAFI web-Service.

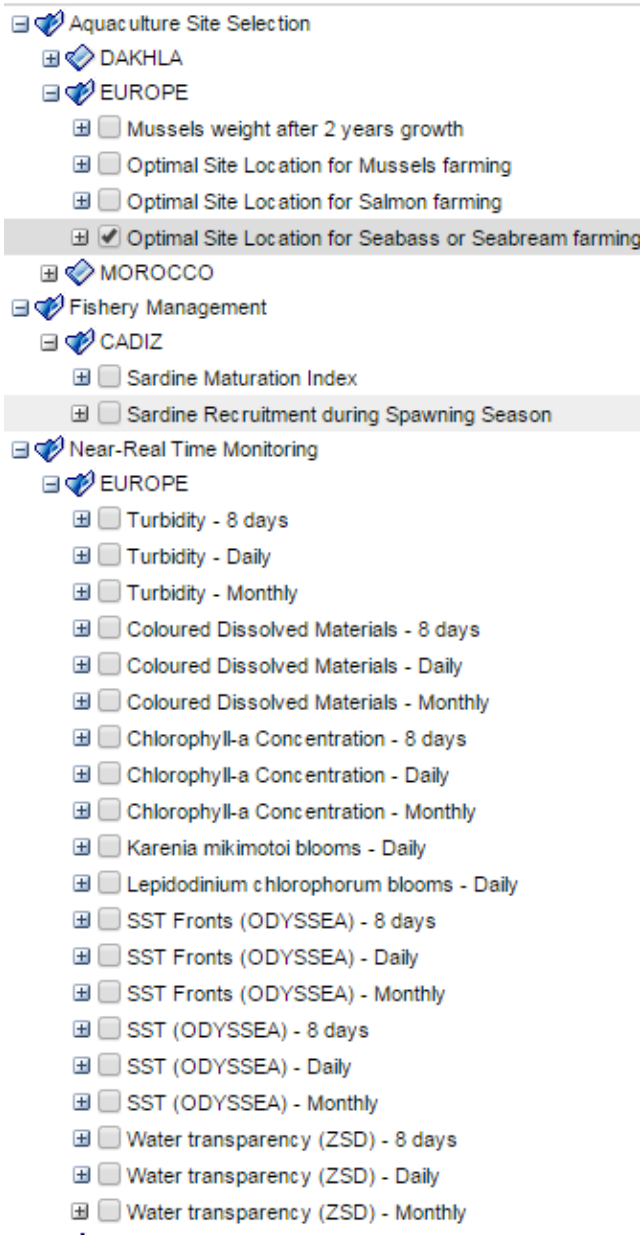

Figure 8: Services provided by the SAFI Web-GIS

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The added value of the provided services is the statistics calculation that can be used to determine **optimal site for a type of aquaculture** based on thresholds of environmental data. The following figure shows, the result for optimal site for Seabass or Seabream farming in Oriental Mediterranean Sea.

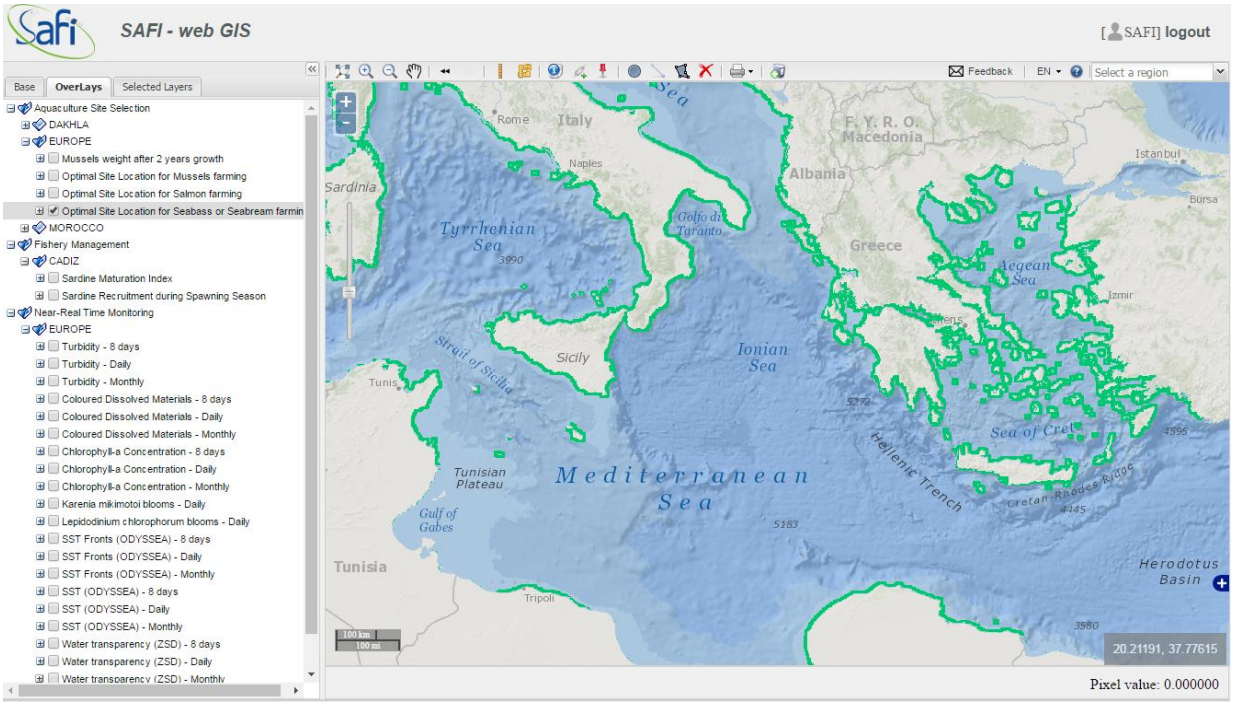

Figure 9: Optimal sites for Seabass or Seabream farming

5.2. Services [Hidromod]

Hidromod is already providing meteo-oceanographic information services to a number of users in different sea related business such as ports, aquacultures or utilities. However, these services are still essentially focused in physical parameters (meteorology, waves, currents, etc.) and they are supported by AQUASAFE platform which, in the current version, has several limitations concerning the number of users it is able to support. In fact, Hidromod is setting up individual AQUASAFE platforms for each different client which works for a limited number of users but it is not practical as the number of users is increasing.

Within HiSea project, Hidromod has the ambition to build a new platform capable to easily manage any number of clients and to enlarge the spectrum of the available information through the addition of relevant water quality parameters. This is also expected to contribute to increase the number of clients by diversifying the kind of information that it will be possible to deliver. The latter is of high relevance once the water quality monitoring at a given location still consists generally of in situ measurements or laboratory analysis of water samples which are

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considered accurate for a particular sampling point in time and space, but they are time consuming and expensive. Furthermore, they do not provide synoptic views of the site, which are necessary to support operation and or management decisions that can affect the business or effectively control or improve water quality. By providing services integrating not only the locally acquired data but also remote sensing data and modelled data, HiSea will provide added value services that are expected to get a positive welcome from the potential users.

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6. Conclusions

The two HiSea workshops on users' needs and requirements were successfully hosted by the consortium and initial analysis of the users' feedback has been done. to map issues and challenges that the HiSea service will tackle. Partners identify water quality as a must for both sectors in order for them to comply with water quality regulations. Each user provided with his own needs based on specific characteristics and experience. Particularly, different issues and challenges for the ports and aquaculture sectors. HiSea platform will provide the two market sectors with different tools, a challenge to englobe all of ports and aquaculture needs in HiSea's services. Operational forecasting system and Early warning system such as hydrological, water quality and hydrodynamic systems are required by both sectors. Accuracy requirements such as temporal and spatial resolution are clearly defined for ports and will be understood for aquaculture through virtual meeting before a forecasting system is put in place. The development of tools will take into consideration existing barriers, in relation to the availability of historical, real-time, reliable data and will provide users with a user-friendly platform by integrating in situ, remote sensing and modelled data.

Moreover, having held two workshops the role of the Stakeholder Advisory Board in reviewing the HiSea service is better defined. SAB members interests in the HiSea platform is revealed by the fact that all representatives have expressed willingness to attend regular workshops, of which 50% will also attend video conferences. Continued efforts to engage stakeholders and identify value for product development will be done. SAB members will be asked to review the designed software (Task 2.3: Design and review of the HiSea software clients) and will be invited to provide feedback and get know on how they can incorporate HiSea services into their daily activities though a hands-on workshop (MS6, MS7). The role of the SAB members is important for the successful design the platform.

By co-designing the platform with end-users, a positive welcome from the potential users (SAB members and others) of the platform is expected. This is expected to maximize the impact of the project and to disseminate the HiSea platform during and beyond the implementation period.

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7. Annexes

7.1 Annex 1: Letters of Interest for Port AB

Port Authority of Valencia

EUROPHAR

Dr Ghada El Serafy
Coordinator of the HISEA Project
Deltares
Boussinesqweg 1
2629 HV Delft
The Netherlands

Date: *February, 28, 2018*

Subject: *Support to Horizon 2020 DT-SPACE-01-EO-2018-2020 HISEA proposal*

Dear Dr. Ghada El Serafy,

Following our discussions with you regarding the Copernicus Market Uptake HISEA proposal to be submitted to the Horizon 2020 DT-SPACE-01-EO-2018-2020 call, we hereby express our true interest in the proposal and its foreseen results and services.

According to our experience, our actual needs lie within the availability of effective easy–to–use high resolution water quality forecasts besides the meteorological and hydro-dynamical data. Following positive experiences with high resolution forecasting services, we see with major interest the proposed improvements by including water quality information. The advantage of Earth Observation data and the add-value information displayed via web-based and/or mobile access would facilitate the use of information and would increase the reliability of the decision-making process in the planning of activities and in the mitigation process of pollution incidents.

It is our opinion that the proposed services will highly contribute to safety in ports and better management through the development of effective Key Performance Indicators using the significant amount of available data available at port facilities.

As discussed, we are very willing to collaborate in the project to help shape the new services being developed, and will cooperate to these aims by sharing our experience, in particular by being available to test the services and provide feedback that may lead to service improvements.

We wish you every success with your proposal and hope to be able to collaborate with you on this innovative project.

Sincerely yours,

EUROPHAR GEIE A.E.I.E.
Muelle del Turia, s/n
46024 VALENCIA
Tel. 34 96 393 95 91
Fax 34 96 393 95 62
ESPAÑA

Federico Torres Monfort
President of EUROPHAR GEIE, A.E.I.E.

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MINISTERIO
DE FOMENTO

Puerto de Melilla
Autoridad Portuaria de Melilla
Dirección

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Coordinator HISEA Project Deltares
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2629 HV Delft
The Netherlands

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We wish you every success with your proposal and hope to be able to collaborate with you on this innovative project.

Sincerely yours,

Luis José Ayala Navarro
DIRECTOR

20/FEB/2018

Avda. de la Marina Española, 4
52001 Melilla – España
Tel. 95 267 36 00
Fax 95 267 48 38
e-mail:

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Dr Ghada El Serafy

Coordinator of the HISEA Project

Deltares
Boussinesqweg 1
2629 HV Delft

The Netherlands

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We wish you every success with your proposal and hope to be able to collaborate with you on this innovative project.

Sincerely yours,

Ioannis Papagiannopoulos, PhD c
PFSO / DPSO / DManager of Security and Environmental Protection Dept

Piraeus Port Authority S.A.
10 Akti Miaouli Str.
185 38 Piraeus - Greece

10, Miaouli Str. 185 38 Piraeus Greece, Ph.: +30 210 4060866, Cel: +30 6974261089, Fax: +30 210 4550125
E-mail: ypapagiannopoulos@olp.gr, website: www.olp.gr

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Autorità di Sistema Portuale
del Mare Adriatico centro settentrionale

We wish you every success with your proposal and hope to be able to collaborate with you on this innovative project.

Sincerely yours,

NAME DANIELE ROSSI

POSITION PRESIDENT

SIGNATURE

Date: *February, 28, 2018*

Subject: *Support to Horizon 2020 DT-SPACE-01-EO-2018-2020 HISEA proposal*

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As discussed, we are very willing to collaborate in the project to help shape the new services being developed, and will cooperate to these aims by sharing our experience, in particular by being available to test the services and provide feedback that may lead to service improvements.

PORTO DI RAVENNA

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RINA

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7.2 Annex 2: Questionnaire for Valencia workshop

Questionnaire for potential participants in International Stakeholder's Forum

HiSea is an EU funded project to explore ways to use a variety of data platforms on the marine environment, including the Sentinel mission and Copernicus Services, to develop high value added information to port operators and stakeholders in aquaculture (https://hiseaproject.com/about-us/overview/). Hi Sea, in close cooperation with users and other stakeholders, employs the know-how and experience of the Consortium (research, development and deployment) to develop, test and demonstrate a range of monitoring and advanced modelling services.

An explicit feature of the project is maximum involvement of end-users in the wider sense, amongst others by setting up an international Stakeholders Forum. This is request to your organization to participate in the activities of such a forum and the brief questionnaire attached serves as a preliminary inquiry for joining the Hi Sea Stakeholders Forum.

Objectives of this questionnaire

The objective of this questionnaire is to:

- identify organizations/Port-users' needs and requirement to co-design HiSea services to improve operation, planning and management ports sector;
- find out what motivates stakeholders to engage in HiSea projects, as well as the extent and the way they would like to get involved;
- determine which potential barriers stakeholders have experienced or are expecting to encounter;
- highlight the potential added value for ports to adopt the HISEA services.
-

Confidentiality

Any confidential data and information given in this questionnaire will be treated strictly as confidential and will not be transferred to third parties.

Name of your organisation: _____

Character of your organisation: _____

Your organisation's contact details: _____

Organisation Related Questions

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On which level do you generally operate (local, national, regional, international)?
Brief description of current activities
Which topics are of interest to you?
Brief description of prospective activities and opportunities

Technical related questions

To what extent does your organization use marine data?
What marine data are you using (e.g. in site measurements, Copernicus products etc.)
To what extent would your organization like to use marine data?
Would you be able to provide us with resources/data you are currently using?
Which barriers/issues did you encounter in using marine data (i.e. temporal resolution, files format, etc.)?
Does your organization use models? (Hydrodynamic prediction models or water quality…) If yes, which models do you use and to what extent?
Have you already identified tools that you would like to use?

General Questions

What benefit can the HiSea platform bring to you?
Which barriers do you think you might encounter in using the HiSea platform (time constrain, personnel limitation, etc.)?
What type of support would you mostly need?
How would you prefer to be involved in the HiSea project (i.e regular workshops, video conferences, etc.)?
Would a representative of your organization be prepared to participate in a community of practice for ports?

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