Innovative blockchain traceability technology and Stakeholders' Engagement strAtegy for boosting Sustainable sEafood visibility, social acceptance and consumption in Europe

D1.1- SEA2SEE STAKEHOLDERS' ENGAGEMENT STRATEGY

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Document Approval

Name	Role	Action	Date
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Nature of the deliverable

R	Document, report (excluding the periodic and final reports)	**X**
DEM	Demonstrator, pilot, prototype, plan designs	
DEC	Websites, patents filing, press & media actions, videos, etc.	
DATA	Data sets, microdata, etc.	
DMP	Data management plan	
Ethics	Deliverables related to ethics issues.	
SECURITY	Deliverables related to security issues	
Other	Software, technical diagram, algorithms, models, etc.	

Dissemination level

PU	Public — fully open (automatically posted online on the Project Results platforms)	**X**
SEN	Sensitive — limited under the conditions of the Grant Agreement	

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Current seafood traceability tools and services have the potential to take advantage of novel blockchain technologies to obtain a wide range of data making sustainable seafood practices more visible to consumers. SEA2SEE project will fill in existing seafood traceability gaps through development and demonstration of an innovative end-to-end blockchain traceability model throughout the seafood value chain and professional and consumer applications, to increase trust and social acceptance of sustainably fished and farmed seafood.

The project will provide technological solutions to answer the need for a valuable source of data collected throughout the whole seafood value chain, verified, and covering inputs from diverse stakeholders. For that purpose, a specific focus will be put on active commitment of stakeholders and real empowerment of consumers through the implementation of societal and sectoral strategies for co-creation, communication and awareness raising.

The project runs from July 2022 to June 2026. It involves 14 partners from 6 EU countries, and is coordinated by SMARTWATER PLANET SL, Spain.

More information about the project can be found at: http://www.sea2see.eu/

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EXECUTIVE SUMMARY

The purpose of this deliverable is to identify stakeholder groups of interest for the SEA2SEE technology with the aim of implementing appropriate and targeted actions for their active involvement and contribution to seafood sustainability. Upon their identification, a framework was created to approach them and collect information on their perspectives to be used as a basis for developing strategies to promote shared understandings, provide information, increase knowledge, and contribute to behavioral change of stakeholders in the seafood value chain.

To achieve the objectives of the project, the existing Research and Innovation Action (RIA) or/and Innovation Action (IA) projects focused on SEA2FORK, which employed collaborative engagement strategies and relevant networks of stakeholders, were identified and analyzed. In addition, an investigation of the applicable international standards related to the SEA2SEE stakeholders' engagement strategy was performed.

Following this, the SEA2SEE stakeholders were identified and classified in two main categories: Fisheries and Aquaculture. In the fisheries field, we have identified nine (9) fishery stakeholder groups (FSt) with 37 sub-groups, while in the aquaculture field, we have identified ten (10) aquaculture stakeholder groups (ASt) with 49 sub-groups. Apart from the categorization, a distinction between internal and external stakeholders was performed. Then, we analyzed the different considerations for the planning, execution and monitoring of the stakeholder engagement activities and defined how these must be addressed in SEA2SEE. In brief, the following were defined: (i) Schedule and resource considerations, (ii) Stakeholders' fatigue, (iii) Stakeholders' expectations, (iv) Cultural diversity, (v) Conflicts between stakeholders. We also described how the stakeholder engagement strategy complies with the FAIR data management principles, data security and ethical aspects of project data collection.

Stakeholders' engagement is crucial for the SEA2SEE technology successful implementation, adoption, and sustainability; therefore, it is important that potential risks are identified early in the process, qualitatively assessed, and monitored, and well-designed mitigation measures and risk responses are put in place. Following this approach, we have identified four "known-unknown" risks (one risk with low possibility, low impact, two risks with low possibility and high impact and one risk with medium possibility and medium impact) and associated mitigation measures.

Gender dimensions and equality are considered in the SEA2SEE stakeholder engagement strategy and are addressed at all stages of the SEA2SEE value chain so that different behaviors and needs are valued and favored equally. In SEA2SEE, the following gender considerations were recognized: (i) Digital fluency, (ii) Interest in sustainability, (iii) Impact on the environment, (iv) Involvement in civil society activities.

SEA2SEE approaches stakeholder engagement, from the early start of the project, therefore we have defined the exact role each partner plays in the stakeholder engagement approach and the relevant stakeholder groups and channels they approach. Following the identification of the stakeholders' groups and the partners' involvement in the engagement process, we performed an analysis of the stakeholders

in terms of their level of engagement (split into three levels: informed, involved, cooperative), their power and interest, as well as the expected benefits to be provided.

Since engagement methods need to be tailored to each specific group in the value chain – e.g., from fishers and aquaculture producers to seafood retailers, distributors, and policy makers – and the specific geographical pilot test sites, to develop a suitable engagement approach/strategy, the matrix level of power/ interest level was used. Based on this, we have selected techniques and methods (and frequency) to be used while engaging with SEA2SEE stakeholders, which included traditional means (conferences, meetings, communication activities) and the use of digital tools and social networks, as a mechanism for continuous, multidirectional communication. Depending on the different SEA2SEE engagement tools, and on the form, which these are applied in (written, oral, public procedures), there are certain advantages and disadvantages which must also be considered. Another important aspect of the stakeholder engagement strategy is timing. In SEA2SEE, it was decided that the relevant stakeholders should be contacted and approached in the early phase of the project and depending on the life-cycle phases of the project, different groups of stakeholders are expected to be involved.

Monitoring the stakeholder engagement strategy and learning from this process is important for future performance of appropriate actions. In SEA2SEE the following types of monitoring stakeholder engagement are considered: (i) Summative assessment, and (ii) Formative assessment, in three different phases: (i) Phase I - Initiation (M1-M6), (ii) Phase II- Ongoing evaluation (M7- M46), (iii) Phase III- Final evaluation (M47-M48).

Finally, despite the evidence of the benefits and great impact that an effective stakeholder engagement strategy could provide, several challenges have been identified to be addressed and analyzed.

ABBREVIATIONS

Abbreviation	Description
AI	Artificial Intelligence
B2C	Business-to-consumer
CRFS	Citizen-led city region food systems
DSS	Decision Support System
EC	European Commission
ECIU	European Consortium of Innovative Universities
EJF	Environmental Justice Foundation
FAIR	Findable, Accessible, Interoperable, and Reusable
FSAs	Food Safety Authorities
FSS	Food Safety System
GRI	Global Reporting Initiative
IMTA	Integrated Multi-Trophic Aquaculture
IA	Innovation Actions
IMTA	Integrated Multi-Trophic Aquaculture
IoT	Internet of Things
LCA	Life Cycle Assessment
OCM	Organizational Change Management
PEF	Product Environmental Footprint
SMEs	Small and Medium-sized Enterprises
RAS	Recirculating aquaculture systems
RIA	Research and Innovation Actions
RRI	Responsible Research and Innovation
WWF	World Wildlife Fund

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1. INTRODUCTION

SEA2SEE will develop a new traceability technology for seafood value chains, focused on blockchain. The Collingridge dilemma, established from David Collingridge, a well-known pioneer in the field of Science and Technology Studies, described the challenges in anticipating the impact of new technologies and innovations, before these are implemented[1], demonstrating that stakeholders' engagement can mitigate these challenges, by setting the ground for the desirable direction in innovation action activities and by aligning the expected outcomes with stakeholders values, needs and expectations. Towards this direction, SEA2SEE stakeholder engagement strategy paves the way for the active participation of different seafood value chain actors, following a co-creation approach, tailored to their needs, and allowing the alignment of technology innovation with existing policies, certification practices and labels.

For this to be achieved, the following steps are implemented for the SEA2SEE stakeholder engagement process:

- **Definition of stakeholders' engagement strategy goals**: this is a tangible statement of what SEA2SEE consortium wants to achieve through the stakeholder engagement process.
- **Identification of stakeholders**: this step aims to identify who affects and/or could be affected by SEA2SEE project outputs and solutions, at the present time and in the future. This step leads to the identification of key stakeholders.
- **Analysis of stakeholders**: the identified stakeholders need to be categorized based on their levels of engagement (informed, involved, collaborative) and degree of power and interest. Knowing the intention and the motivation of the stakeholder is the basis for the development of a proper and successful stakeholder engagement plan which ensures the success of the SEA2SEE project and contributes to reaching its objectives. In fact, it is important to understand stakeholders' needs and their expectations from the engagement. Identifying the level of awareness of the different stakeholders with regards to the project's main focuses (seafood traceability in value chain, seafood sustainability, blockchain technology, etc.) assists in defining a proper engagement plan and tailoring it for the different needs and expectations.
- **Definition of the strategy**: this step will make sure that each identified stakeholder group is engaged in a specific way and with dedicated techniques/tools based on the key characteristics analysis.
- **Implementation of the strategy**: stakeholders need to be properly informed about the project (including its goals and opportunities), the engagement process and expected timelines, the consortium expectations from their contribution, and the added value of taking part in the project. Depending on the stakeholder, different tools/techniques will be used, such as face to face meetings, communication supports (e.g., flyers, newsletters, blogs, website), workshops, and demo sessions on the demonstration sites. These exchanges are fundamental to present to the different stakeholders the SEA2SEE project (general view, goals, timelines), to exploit and

[1] Genus et al., Collingridge and the dilemma of control: Towards responsible and accountable innovation, Research Policy Volume 47, Issue 1, February 2018, Pages 61-69

disseminate SEA2SEE results. The project stakeholders are then able to communicate about SEA2SEE and disseminate its results within the wider community they represent (for example during side events).

- **Assessment of methods/techniques**: Once the action plan is implemented, it is fundamental to keep assessing the chosen methods/techniques on a regular basis to ensure the success of the plan. If needed, changes and improvements will be implemented. Stakeholders' feedback has as well a key role in the improvement of the engagement strategy.

1.1 SEA2SEE PROJECT AND STAKEHOLDERS

In the wake of the onset of human food and animal feed crises, several EU environmental and food safety policies (Green Deal[2], Bioeconomy[3], Circular Economy[4], Nature Based Solutions[5], Blue Infrastructure[6], Blue Natural Capital, Blue Growth, Farm 2 Fork Strategy[7], CFP) have been introduced aiming to ensure a high level of safety during the production and distribution pipeline for all food products marketed within the EU. Seafood is the most traded food commodity worldwide, even exceeding trade of agricultural food products [8]. The globalization of markets and concerns about food safety have resulted in a growing interest in food traceability by consumers[9].

Value chains for seafood are different depending on the species/products and countries and regions, consisting of different chains to meet different markets and market demands. In addition, in the last years there have been several changes because of the advancements in technology and increased uptake of transportation, logistics and storage services[10]. However, in the seafood sector, there are still certain limitations that need to be addressed, such as lack of information on the seafood products, unavailability of digitalization and software solutions for seafood products traceability, so that transparency and traceability are realized.

The SEA2SEE project aims to build and increase trust and acceptance of sustainably farmed and fished seafood amongst stakeholders and consumers through the design, development, and demonstration of an innovative end-to-end blockchain-based traceability model for the seafood value chain and implement societal and sectoral strategies for co-creation, communication, and awareness of sustainably fished or farmed nutritious seafood.

[2] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en
[3] https://research-and-innovation.ec.europa.eu/research-area/environment/bioeconomy_en
[4] https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en#:~:text=The%20EU's%20transition%20to%20a,entire%20life%20cycle%20of%20products.
[5] https://research-and-innovation.ec.europa.eu/research-area/environment/nature-based-solutions_en
[6] https://ec.europa.eu/environment/nature/ecosystems/pdf/swd_2019_193_f1_staff_working_paper_ en_v4_p1_1024680.pdf
[7] https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en
[8] Leal et al., Seafood traceability: current needs, available tools, and biotechnological challenges for origin certification, Trends in biotechnology, Volume 33, Issue 6, June 2015, Pages 331-336
[9] Garaus et al., The influence of blockchain-based food traceability on retailer choice: The mediating role of trust, Food Control, Volume 129, November 2021, 108082
[10] Creydt et al., Blockchain and more - Algorithm driven food traceability Food Control, 105 (2019), pp. 45-51

SEA2SEE aims to:

- Develop a co-creation approach to sustainable seafood transparency and traceability, by the early identification and involvement of the stakeholders in the design and development of the SEA2SEE solution.
- Increase awareness and design of educational practices toward increasing sustainable seafood consumption.
- Design and implement a blockchain deployment platform for seafood industry-specific traceability data collection, connected to an aquaculture production management software and value chain data collection tool for professional end-users.
- Provide evidence on the feasibility and the expected benefits of the proposed SEA2SEE blockchain model, through the demonstration of its adoption in real environment conditions.
- Develop a standardized framework for identifying and quantifying the major sources of environmental impact by Life Cycle Assessment (LCA) implementation to be considered in aquaculture management and consumer awareness.

1.2 RELATION TO OTHER WORKPACKAGES OF THE SEA2SEE PROJECT

The proposed stakeholders' engagement strategy is a prerequisite for the successful implementation of the SEA2SEE concept, since the input collected and analyzed by the targeted stakeholders directly determines the work performed in "WP1: From bottlenecks to strategy building for the seafood value chain stakeholders", guides "WP2: Consumer Engagement, co-creation and behavior change", influences "WP3: Traceability technologies development" as well as the application of the SEA2SEE results in "WP5: Demonstrations" and "WP6: Life Cycle Analysis, Impact and Market Uptake". In addition, since the stakeholders' engagement strategy and communication are interconnected activities "WP7: Communication, dissemination" is also closely related (Figure 1).

Figure 1: Stakeholders engagement strategy link to SEA2SEE project activities.

"WP1: From bottlenecks to strategy building for the seafood value chain stakeholders" and "WP2: Consumer Engagement, co-creation and behavior change" are among the WPs closely linked, and therefore to ensure a successful stakeholder strategy, WP1 and WP2 partners developed a novel

methodology, which targets all the stakeholder groups along the bricks of the seafood value chain (Figure 2).

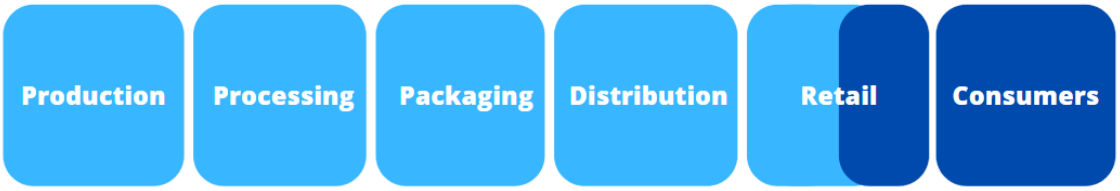

Figure 2: Distribution of targeted stakeholders by WP1 (light blue) and WP2 (blue).

In more detail, WP1 actions and interventions mainly address the stakeholders identified at the beginning of the value chain (production, processing, packaging, distribution, and retail). At the same time, the WP2 engagement strategy is focusing on seafood end-consumers. Both WPs target stakeholders included in the retail dynamics (e.g., HORECA, supermarkets, restaurants etc.). Therefore, WP2 consumer engagement strategy is complementary to the one developed by WP1 (Figure 3) to ensure targeted actions for all the different stakeholder groups along the value chain. WP2 strategy builds on WP1 output, and both approaches contain detailed planning for multi-stakeholder engagement.

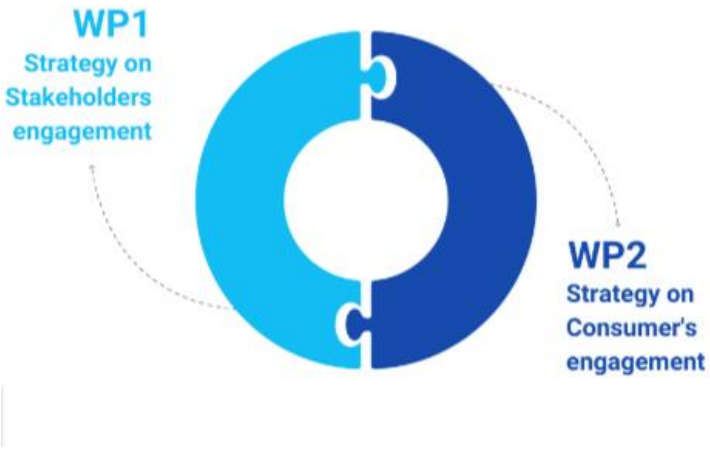

Figure 3: Complementarity of Stakeholder Engagement Strategies developed in WP1 and WP2.

The methodology for stakeholder identification is similar in both WPs; it leads to the development of a stakeholder map, together with a matrix of power/interest supporting the selection, prioritization and contact of relevant actors for the implementation of actions throughout the project duration. Both strategies are driven by the co-creation approach, meaning stakeholders are being contacted and engaged in developing tools that fully meet their needs. The aim of the WP1 engagement strategy is to explore stakeholders' needs and barriers to engagement, while the WP2 engagement strategy empowers consumers and makes them well-informed about the seafood value chain. Altogether, both WPs promote seafood transparency in the value chain, providing the necessary information for the involved nodes and the end consumers.

1.3 DELIVERABLE STRUCTURE

In the following Figure the structure of D1.1 is presented.

Figure 4: Deliverable sections structure.

2. BACKGROUND AND CONTEXT FOR ENGAGEMENT ACTIVITIES

In this section, we present similar RIA and/or IA projects, as well as International Standards, which have been identified and are being considered for the SEA2SEE stakeholders' engagement strategy.

2.1 RIA & IA PROJECTS

This section describes similar RIA and/or IA funded projects to SEA2SEE. Specifically, these projects were identified since these are related to the food value chain, incorporate stakeholders' engagement strategies and/or promote results and have as objective the traceability, in the seafood value chain. Among others, for each project, the following information is provided: (i) Project Title, start/end date, and duration, (ii) Main project objective and relevance to SEA2SEE, (iii) Engagement strategy, existing networks, and stakeholders' groups.

FISHEUTRUST: European integration of new technologies and social-economic solutions for increasing consumer trust and engagement in seafood products	
Duration: 2022 – 2026 (Ongoing)	**GA:** 101060712
Website: https://fisheutrust.org/	
FishEUTrust project aims to develop a digital platform for allowing different actors, from the field of technology, supply chain, consumption and policy making, to interact and co-create towards increasing the consumer trust and engagement in seafood products. The FishEUTrust digital platform will be demonstrated in five Co-creation Living Labs (Mediterranean Basin, Atlantic Sea, North Sea). The platform will integrate multi-disciplinary markers (metagenomics, genetics), diverse techniques (e.g., isotopic techniques) and digital technologies (e.g., blockchain) to be used by artificial intelligence and data mining methodologies. The main outcomes of FishEUTrust project can be summarized as follows: (i) Creation of the Demo Living Labs, (ii) Design and implementation of tailored strategies for consumer trust building, (iii) Development of digital supply chain tools, sensors, and monitoring systems for seafood safety, (iv) Evaluation of the benefits of FishEUTrust uptake, in terms of environmental footprint and sustainability aspects. **A Collaborative workshop has been organized in M6, between SEA2SEE and FISHEUTRUST (sister projects) aiming at presenting the projects' stakeholder mapping strategies and discussing common action plans.*	
Identified Stakeholders: Field of technology, supply chain, consumption and policy making.	
Engagement Strategy: The stakeholder engagement strategy is based on the Quadruple helix stakeholders and will be initially available on M6 of its lifetime.	

FISH-X: Providing a European fisheries dataspace through a consultative approach	
Duration: 2022-2025 (Ongoing)	**GA:** 101060879
Website: https://fish-x.eu/	
FISH-X aims to develop a Fisheries DataSpace (Fish-X) and "Insight Platform" based on smart orchestrated architecture and open interoperable technology via Gaia-X, for enabling the users to: (i)	

Improve fishing methods, (ii) Protect endangered fisheries stocks, and (iii) Streamline manufacturing execution processes supporting the implementation of the common fishery policies. The project will also be developing a series of industry and fisheries agency to consultatively participate in developing and refining new technologies considering the changes and review of CFP.
Identified Stakeholders: Stakeholders identified in fisheries supply chain
Engagement Strategy: N/A

AQUAPEF: Implementation of product environmental footprint in the Mediterranean aquaculture sector	Life AQUAPEF
Duration: 2019 -2022 (Ongoing)	**GA:** 101060712
Website: https://lifeaquapef.eu/	
AQUAPEF project aims at enhancing the adoption of the Product Environmental Footprint (PEF) strategy in the field of Mediterranean aquaculture by designing and delivering an integrative methodology for facilitating data availability, footprint evaluation, verification, and Business-to-Consumer (B2C) communication. The main outcomes of AQUAPEF project can be summarized as follows: (i) Creation of a protocol for standardization data collection to be used by the aquaculture sector registries, (ii) Collection of representative data from the Mediterranean aquaculture field, (iii) Development of an integrated methodology for PEF evaluation and assessment, (iv) Demonstration of the developed PEF methodology in three demo sites, and (v) Creation of awareness in sustainable food production.	
Identified Stakeholders: Companies, associations, and consumers.	
Engagement Strategy: Not publicly described.	

FOODSAFETY4EU: Multi-stakeholder platform for food safety in Europe	FoodSafety4EU
Duration: 2021- 2023 (Ongoing)	**GA:** 101000613
Website: https://foodsafety4.eu/	
The main outcome of FOODSAFETY4EU is to design, develop and make it public a multi-stakeholder platform for the future European Food Safety System (FSS). The platform aims to establish a network of FSS actors at national, European, and international levels. The proposed platform exploration will enhance the cooperation of the stakeholders with civil society boosting the co-creation of strategies and their translation into policies.	
Identified Stakeholders: Food Safety Authorities (FSAs), EU Agencies, policy makers, scientists, and civil society.	
Engagement Strategy: Data management platform, Forum.	

FOODE: Food Systems in European Cities	
Duration: 2020- 2024 (Ongoing)	**GA:** 862663
Website: https://foode.eu/	
The EU-funded FoodE project aims to accelerate the growth of Citizen-led city region food systems (CRFS) by bringing together local initiatives across Europe and co-developing and disseminating new tools to promote citizen-driven food systems. During the project's lifetime an online app for the review and monitoring of CRFS will be developed. Also, the consortium will implement and scale up 15 CRFS pilot projects in 12 EU cities/regions, involving coastal, rural, and urban areas and classify innovative business models in CRFS and review existing certification labels. At the end, FOODE will propose a new CRFS ecolabel.	
Identified Stakeholders: Citizens, food system start-ups and small businesses operating in the urban food landscape, cities and regional authorities, academia, schools.	
Engagement Strategy: Involvement of stakeholders in project pilots, surveys, use of the FOODE smartphone application.	

TRUSTEAT: Building a trusty future food system by using blockchain tech	
Duration: 2020 -2023 (Ongoing)	**GA:** 952600
Website: https://www.trusteat.eu/	
TrustEat project aims to create an ecosystem for delivering a food value chain capitalizing on the benefits provided by the blockchain technology. TrustEat solutions involve the development of: (i) Digital tools (digital layer), (ii) Internet of Things (IoT) sensors targeting the monitoring of food risks during the whole food value chain, and (iii) Anti-counterfeiting materials. One of the key outcomes of TrustEat project is the creation of a strategic roadmap for guiding the training of senior and junior researchers and implementing different activities with stakeholders to make the outcomes of TrustEat project sustainable and acceptable by the targeted stakeholders.	
Identified Stakeholders: Experts in the field of software development and devices and food value chain experts (farmers, producers, distributors, retailers, consumers), research and academy, agrifood clusters, big companies and SMEs, policymakers, professionals in the IT sector.	
Engagement Strategy: Workshops, expert meetings and visits, virtual cooperative platform, etc.	

AquaVitae: New species, processes and products contributing to increased production and improved sustainability in emerging low trophic, and existing low and high trophic aquaculture value chains in the Atlantic	
Duration: 2019 – 2023 (Ongoing)	**GA:** 818173
Website: https://aquavitaeproject.eu/	

The AquaVitae promoted sustainable aquaculture production and the development of new low trophic species in aquaculture value chains, including macroalgae, Integrated Multi-Trophic Aquaculture (IMTA), shellfish, echinoderms, and finfish. The AquaVitae works and analyses the whole aquaculture value chain, from analyzing market potential of new products to the policy framework. AquaVitae plans to set up an industry and research network with particular attention to social responsibility and community outreach. During the project's lifetime good practice standards will be proposed, training programs for specialists and the public, focusing on a circular economy and the zero-waste will be designed and implemented.
Identified Stakeholders: Industry and research, policy and governance, consumers.
Engagement Strategy: Training programs.

SafeConsumE: Safer food through changed consumer behavior: Effective tools and products, communication strategies, education and a food safety policy reducing health burden from foodborne illnesses	SAFE CONSUME
Duration: 2017 – 2022 (Ongoing)	**GA:** 727580
Website: https://safeconsume.eu/	
The aim of SafeConsumE is to provide effective, science-based, and sustainable strategies for food authorities, market actors and the research community to help consumers mitigate risk, reducing the health burden from food-borne illness in Europe. SafeConsumE promoted tools, technologies and products that stimulate safe practices. In addition, the consortium exploited communication strategies to stimulate the adoption and market uptake of safer practices along with education programs increasing skills and knowledge aiding younger society to handle food safely.	
Identified Stakeholders: Food authorities, market actors, research community, consumers.	
Engagement Strategy: Surveys, educational programs, interviews covering 10 EU countries and > 1200 people, games for changing behavior.	

BioMonitor: Monitoring the Bioeconomy	biomonitor
Duration: 2018 – 2022 (Ongoing)	**GA:** 773297
Website: http://biomonitor.eu/	
The main objective of BioMonitor is to establish a sustainable data and modelling framework for bioeconomy. This was achieved by developing and implementing a data and modelling framework that is effective (supported by a stakeholders' platform) and robust (implementable in existing systems of statistical and customs offices, laboratories, and industries).	
Identified Stakeholders: Custom labs, statistical officers, SME, industry, policymakers.	
Engagement Strategy: Stakeholder engagement platform for tailored training.	

The Fish Forward Project 2018-2020	
Duration: *2015-2020* (Closed)	
Website: *https://www.fishforward.eu/*	
FISH FORWARD is a pan-European project raising awareness of social and environmental impacts of fish consumption. World Wildlife Fund (WWF) and Environmental Justice Foundation (EJF) teamed-up with partners in Europe and the developing world – to drive the European market and European market in a more sustainable direction. Among the key outputs of the project are the WWF online seafood guides which encourage and empower consumers to make the right choice buying seafood. The guide provides useful and attractive information about the country's most common seafood products.	
Identified Stakeholders: European market, consumers.	
Engagement Strategy: based on the European Union's Development Education and Awareness Raising Programme (DEAR) which supports projects that engage Europeans in worldwide issues ofsocial, economic and environmental development.	

SeafoodTrace: Intelligent Traceability Platform enabling full transparency in the Seafood supply chain	SEAFOOD IQ
Duration: 2018- 2018 (Closed)	**GA: 816070**
Website: https://cordis.europa.eu/project/id/816070	
The objective of the project is the validation and finalization of SeafoodTrace, an intelligent traceability platform which provides a one-stop shop covering traceability, quality control automation in inventory management and new format information. The latter is based on cutting-edge technology including anti-tamper smart labels based on printed, temperature sensors, and an innovative, blockchain-enabled IoT platform which provides an end-to-end overview of the supply chain.	
Identified Stakeholders: SMEs, seafood processors, logistics, transporting/logistics, consumers.	
Engagement Strategy: Education, product storytelling.	

SEAFOOD^{TOMORROW}: Nutritious, safe and sustainable seafood for consumers of tomorrow	SEAFOOD TOMORROW
Duration: 2017 -2021 (Closed)	**GA:** 773400
Website: seafoodtomorrow.eu/	

The main objective of SEAFOOD^{TOMORROW} was to underpin the seafood production and processing industry in Europe. SEAFOOD^{TOMORROW} proposed validated, market-driven, and consumer-responsive eco-innovative sustainable solutions, which enhanced food security and safety, mitigating production hazards, and increasing consumer awareness of seafood quality and safety. The project proposed novel feeds for fishmeal and fish oil, with sustainable eco-friendly natural ingredients aquaculture. In addition, validated methods have been developed to reduce contaminants in seafood produce and ready-to-eat products. In SEAFOOD^{TOMORROW} a concept for an accredited certification scheme, based on a benchmark tool and utilizing a quality label was proposed which at the end was linked to a new seafood traceability tool. Moreover, healthy products and informative tools, where partners have created delicious recipes for new, ready-to-eat seafood dishes that meet consumer dietary needs were developed.

Identified Stakeholders: Research teams, SMEs, IAGs and innovation parties' consumers, industrial stakeholders, policy actors and wide society.

Engagement Strategy: Customized transfer activities for each target audience, demonstration workshops, policy meetings, FishChoice (web-based tool and smartphone app that provides detailed information on the seafood benefits and risks).

PrimeFish: Developing Innovative Market Orientated Prediction Toolbox to Strengthen the Economic Sustainability and Competitiveness of European Seafood on Local and Global markets	PrimeFish
Duration: 2015 – 2019 (Closed)	**GA:** 635761
Website: http://primefish.cetmar.org/	

The economic sustainability of European fisheries and aquaculture sectors is the primary aim of PrimeFish. Through data collection from individual production companies, industry and sales organizations, consumers, and public sources, PrimeFish developed an innovative Decision Support System (DSS) exploiting state-of-the-art Artificial Intelligence (AI) modeling. The decisions were based on information related to the competitiveness and economic performance of companies in the sector, supply chain relations, markets, consumer behavior and successful product innovation. At the end PrimeFish developed also an App, the so called "Willingness To Pay", which identifies the willingness of consumers to pay for salient product attributes — wild caught or farmed fish, health claims, and sustainability labeling.

Identified Stakeholders: Fishers, aquaculture producers, consumers and public sources, individual production companies, industry, and sales organizations.

Engagement Strategy: Mobile application (survey tool-customer reported outcomes).

Additional EU projects which have been considered in the SEA2SEE Stakeholder engagement strategy and are also targeted by the SEA2SEE synergy plan (D7.4) are the EveryFish [11], the ASTRAL [12], the FutureEUAqua[13], the AquaExcel3.0 [14]and the PerformFish[15] projects.

2.2 INTERNATIONAL STANDARDS FOR STAKEHOLDER ENGAGEMENT AND REPORTING

SEA2SEE stakeholders' engagement strategy considers the following international standards:

- **AA1000 Stakeholder Engagement Standard (AA1000SES) [16].** The AA1000SES is a generally applicable framework created by the NGO AccountAbility and provides a strategy for the design, implementation, communication, and evaluation of stakeholder engagement based on good-quality practices. AA1000SES focuses on enabling and guiding the stakeholder engagement, both targeting internal and external public, private and civil society institutions, and organizations. It is a standard supporting the collection of the following key questions to be addressed in each stakeholder engagement strategy:
    - *What is the purpose and objectives of the stakeholder engagement strategy?*
    - *How the stakeholders could be approached and engaged?*
    - *What are the means for monitoring and evaluating the stakeholder engagement process?*
- **International Standard, ISO 26000:2010, Guidance on social responsibility[17]**. ISO 26000 aims to assist in guiding social responsibility by considering several aspects of societal, cultural, political, organizational, and economic diversity for achieving social responsibility. ISO 26000 sections cover the: (i) Social responsibility concept, background and main characteristics, and related principles, (ii) Stakeholders identification and engagement practices, and (iii) Communication and performance assessment methods.
- **Global Reporting Initiative (GRI)[18].** The GRI defines a list of indicators to be addressed during stakeholders' engagement and the main processes for achieving stakeholder engagement including mapping of the stakeholders, creation of engagement models, identification of potential issues, risks, and opportunities for stakeholder engagement.
- **UN Global Compact (UNGC)[19].** The UNGC is a strategic initiative supporting the alignment and the creation of strategies and principles for good business practices on human rights. The advantages offered by adopting the UNGC principles can be summarized as follows**:** (i) Understanding stakeholders assists in taking better decisions, (ii) Informing stakeholders enables a better understanding of the project/business/product/service needs, (iii) Actively involving the

[11] https://cordis.europa.eu/project/id/101059892
[12] https://cordis.europa.eu/project/id/863034
[13] https://cordis.europa.eu/project/id/817737
[14] https://aquaexcel.eu/
[15] http://performfish.eu/
[16] "AA1000 Stakeholder Engagement Standard. https://www.accountability.org/ .
[17] https://www.iso.org/iso-26000-social-responsibility.html
[18] Global Reporting Initiative (GRI). https://www.globalreporting.org/
[19] UN Global Compact (UNGC). https://www.unglobalcompact.org/

stakeholders allows the building of empathy and trust, the mitigation of risks and creation of value to the project/business/product/service.

3. SEA2SEE STAKEHOLDER ENGAGEMENT FRAMEWORK

3.1 WHO IS A SEA2SEE STAKEHOLDER

To adequately design the stakeholder strategy, it is of paramount importance that we first define the stakeholders. SEA2SEE adopts the broad definition of stakeholders as follows[20] "***Stakeholders are individuals and organizations who are actively involved in the SEA2SEE solution design and development, or whose interests may be positively or negatively affected as a result of the solution execution or successful project completion***".

Therefore, in the process of the SEA2SEE stakeholder identification, the following questions were answered: (i) *Who is directly or indirectly affected by the SEA2SEE final outcomes and/or independent solutions*, (ii) *Who would like to be involved in the SEA2SEE co-creation and co-development processes?* (iii) *Which are the companies/organizations/independent bodies which could be invited to join the SEA2SEE stakeholder registry*? (iv) *How many stakeholders do we consider to be engaged?*

Stakeholder identification is a continuous and evolving process reassessed regularly throughout the SEA2SEE project to make sure that all stakeholders are timely and effectively engaged and that their opinion/expectations and concerns are taken into consideration. During the first six months of the SEA2SEE project, certain stakeholder groups have been identified. However, as the activities and results of the project progress and the stakeholder needs and priorities evolve, new stakeholders may be identified, following an iterative process for stakeholder identification and engagement.

To identify stakeholders, a tight collaboration and several brainstorming meetings were held between the SEA2SEE partners. The methodology followed for the SEA2SEE stakeholder identification can be summarized as follows: (i) Creation of a sketch map of the main SEA2SEE components, (ii) Identification of the broad stakeholder groups for each of the SEA2SEE components, (iii) Progressively defining stakeholders and identifying who could be approached from each stakeholder group. At this point, it should be highlighted that pre-existing networks were a valuable source for implementing the process of SEA2SEE stakeholder identification.

A key tool used in the identification of the SEA2SEE stakeholders was the template used by the SEA2SEE partners for creating the SEA2SEE stakeholder registry (Figure 5). The file was created at the beginning of the project and was progressively elaborated and updated by all SEA2SEE partners. Among the information collected was the type of group and subgroup, the description of the main activity of the stakeholder, the title/name, the contact person and contact details, the level of engagement/awareness and the type of

[20] https://www.pmi.org/learning/library/stakeholder-analysis-pivotal-practice-projects-8905

messages/engagement tools to be distributed. An overview of the SEA2SEE stakeholder registry is included in the Annex section.

Stakeholders Identification						Analysis	Types of messages
ID [st.y.y.y] Group, Subgroup, Specific]	Title	Description	Contact/Details	Participates in Reqs [y/n]	Participates in communication [y/n]	Level of awareness	
st1	Production						
St1.1							
St1.1.1							
St1.2							
ST1.3							

Figure 5: Template used for SEA2SEE stakeholder registry creation.

In addition, in the process of compiling the SEA2SEE stakeholder engagement strategy the consortium partners utilized the following tools:

1. **Coggle**[21]: an online software for creating and sharing mind maps and flowcharts. It was utilized to visualize the identified stakeholders' groups and subgroups as a mind map chart.
2. **Smaply**[22]: is a web application which offers a stakeholder mapping tool that helps to better understand the stakeholder's perspectives and manage their expectations. It was utilized extensively to map the engagement level of stakeholders.
3. **Excel Sheets**: utilized to create the template matrix for the stakeholder identification and collection.
4. **Python scripts** (viz libraries): script to create the scatter plots for the power/interest mapping of the various stakeholders' groups.

Following this methodology, we have identified the following two main categories: **Fisheries** and **Aquaculture**. Fisheries and aquaculture production is one of the most important sources of seafood with a vital role in coastal economies, therefore it is crucial to ensure long-term sustainability and traceability of these seafood value chains.

Increasing transparency, support and building trust in fisheries can be achieved by the analysis of the SEA2SEE value chain actors and stakeholders involved. In the fisheries field, we have identified nine (9) fishery stakeholder groups (FSt) with 37 sub-groups (Figure 6) in:

- **(FSt1) Production**, including: (1) Small-Scale Fisheries, and (2) Commercial fisheries.
- **(FSt2) Collection from production**, including buyers at auction.
- **(FSt3) Processing and packaging,** including: (1) Packaging companies, and (2) Processing companies.
- **(FSt4) Distribution logistics,** including: (1) Importers, (2) Exporters, (3) Networks of distribution for eco-consumer groups, and (4) Individual and collective auction buyers.

[21] https://coggle.it/
[22] https://www.smaply.com/

- **(FSt5) Sales**, including: (1) Consumers (individuals) segments, (2) Consumer clusters, (3) Public markets/fish auctions, (4) Supermarkets, (5) Seafood specialized shops, (6) HORECA representatives (restaurants, catering & Hotels) (7) Social services & Municipalities, (8) Canteens (schools, hospitals, etc.), (9) Education - Cooking schools and, (10) Exhibitions.
- **(FSt6) Administration agencies, public services, public institutions**, including: (1) Decentralized administrations, (2) Regional units / fisheries departments, (3) National fisheries departments, (4) University departments & research centers, (5) Policymakers, (6) Administration agencies, Public services & Public institutions, (7) National committees for marine fisheries, (8) Regional authorities and, (9) Local authorities, and (10) Ministry and agencies.
- **(FSt7) Non-governmental organizations (NGOs), Trade Unions, or others** involved in awareness campaigns around seafood value chain, traceability, sustainability, and decision-making processes, including: (1) NGOs, (2) Consultancy & Advocacy organizations or individuals, and (3) Public Institution Campaigns.
- **(FSt8) National and European projects and networks,** including**:** (1) Twin projects, and (2) Networks.
- **(FSt9) Media & Influencers,** including: (1) Local and National press agencies, (2) TV programs, Radio programs and social media channels, and (3) Food influencers/seafood ambassadors/food writers

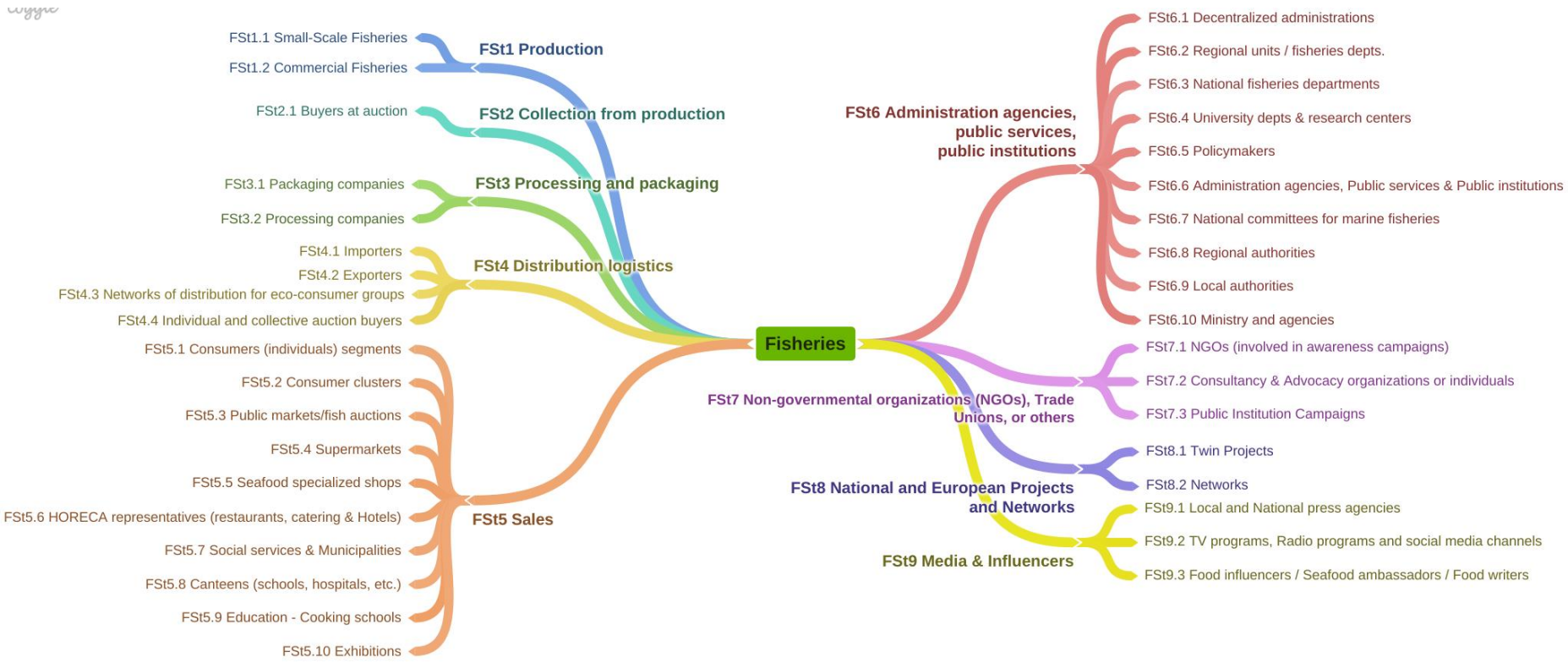

Figure 6: SEA2SEE Stakeholders in the Fishery Domain.

In the aquaculture field, we have identified ten (10) aquaculture stakeholder groups (ASt) with 49 sub-groups (Figure 7) in:

- (**ASt1) Production**, including: (1) Fish farming systems (Cage aquaculture, Recirculating aquaculture systems (RAS), Flowthrough, Earthen Ponds), (2) Fish Veterinarians, and (3) Ichthyologists/Staff/Human Resources.
- **(ASt2) Collection from production**.
- **(ASt3) Processing and Packaging**, including: (1) Packaging companies, (2) Seafood processing companies, (3) Labeling/Auditing companies, (4) Suppliers of Quality control systems, (5) Design and equipment for processing companies/Processors.
- **(ASt4) Distribution Logistics,** including: (1) Logistics Companies, (2) Importers, (3) Exporters, and (4) Networks of distribution for eco-consumer groups.
- **(ASt5) Sales**, including: (1) Consumers (individuals) segments, (2) Consumers clusters, (3) Supermarkets, (4) Wholesalers, (5) Public Markets/ Fish auctions, (6) HORECA Representatives (Restaurants, Catering & Hotels), (7) Social services of municipalities, (8) Canteens (schools, hospitals, etc.), (9) Education - Cooking schools and, (10) Exhibitions.
- **(ASt6) Upstream components in the aquaculture seafood chain,** including: (1) Aquaculture Equipment/utilities (engineering), (2) Consultants (engineering, biologists, and economists), (3) Aquaculture feed companies, (4) Aquaculture Management Software companies, (5) Aquaculture sensors and IoT companies, (6) Nets/cages suppliers and, (7) Investors in aquaculture.
- **(ASt7) Administration agencies, public services, and public institutions,** including: (1) Policymakers and Food Safety Authorities, (2) Administration agencies, public institutions, (3) Universities, (4) Areas of Organized Aquaculture Development (POAY) Management Bodies, (5) National committees for marine fisheries, (6) Regional authorities, (7) Local authorities and, (8) Ministry and agencies.
- **(ASt8) National and European projects and networks, including:** (1) Twin projects, (2) Networks.
- **(ASt9) Media & influencers,** including: (1) Local and National press agencies, (2) TV programs, Radio programs and social media channels, and (3) Food influencers/seafood ambassadors/food writers.
- **(ASt10) Non-governmental organizations (NGOs), Trade Unions, or others** involved in awareness campaigns around seafood value chain, traceability, sustainability, and decision-making processes, including: (1) NGOs, (2) Consultancy & Advocacy organizations or individuals, (3) Public Institution Campaigns, (4) Federation of Aquaculture Producers, (5) Aquaculture SMEs Union, and (6) Association of Aquaculture producers.

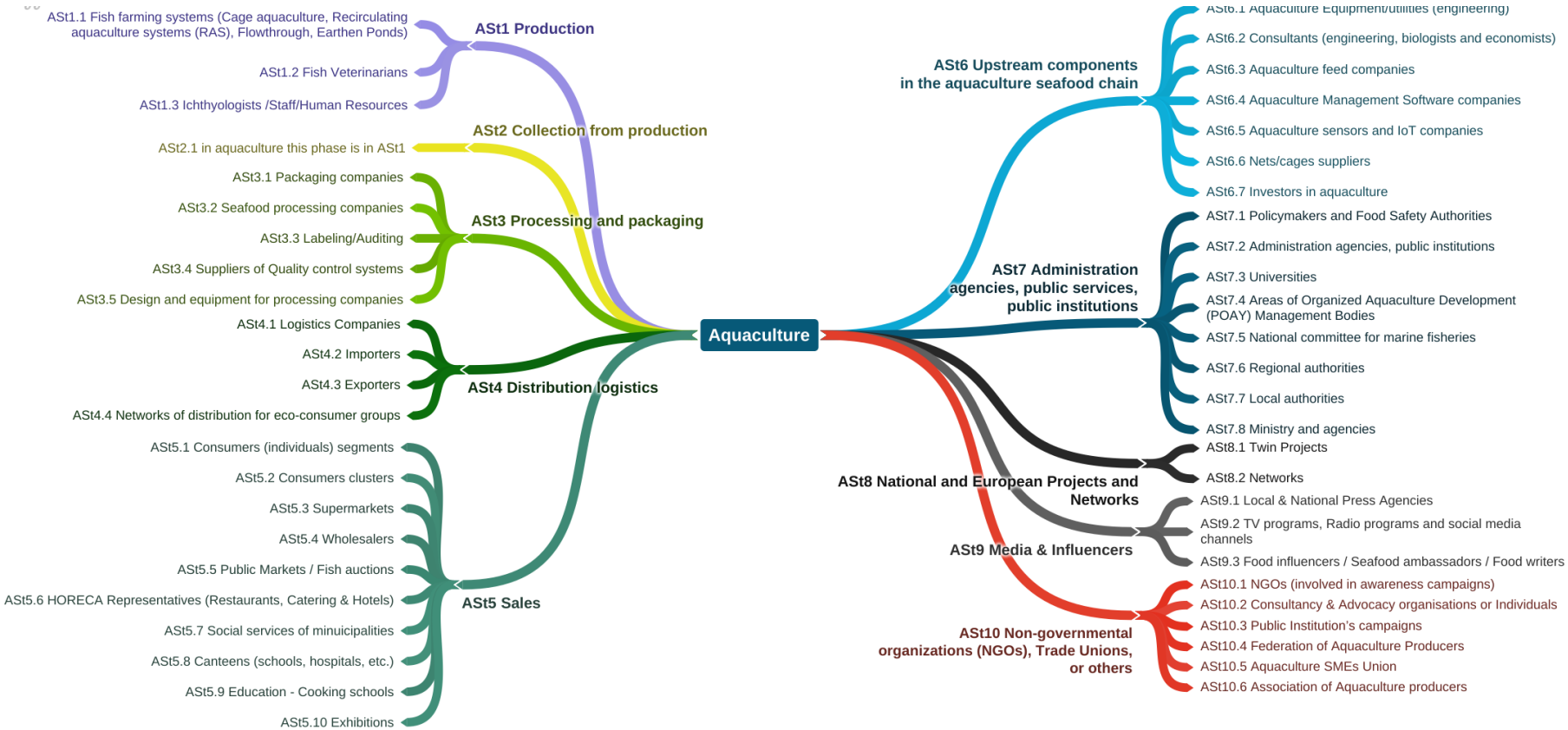

Figure 7: SEA2SEE Stakeholders in the Aquaculture Domain.

In addition, in SEA2SEE, there is a distinction between internal and external stakeholders; **internal stakeholders** are considered those who are participating as partners in the SEA2SEE project, and whose activities are contributing to the final SEA2SEE outcomes and exploitable products, while **external stakeholders** are those who are not part of the SEA2SEE project activities development but are directly and/or indirectly affected by the activities and outcomes of the project.

3.2 STAKEHOLDER ENGAGEMENT CONSIDERATIONS

To effectively engage SEA2SEE stakeholders, the following considerations will be taken into account for the planning, execution and monitoring of the stakeholder engagement activities.

- ***Schedule and resource considerations***. To approach the stakeholders and build trust, the appropriate scheduling and resources requirements should be considered.
  How SEA2SEE addresses this consideration: In SEA2SEE scheduling involves the engagement of stakeholders from the beginning of the project and during all the different phases of the project, including, but not limited to, the development and adaptation of the SEA2SEE digital traceability innovative tools and the blockchain platform for end-to-end traceability, the deployment phase with 5 real life case studies to trace 5 seafood value chains, the Life Cycle Analysis (LCA) and food quality analysis, and the replication and wide exploitation of SEA2SEE results. Depending on the stakeholder group, each SEA2SEE partner approach (See section 4) and the engagement activities, adequate human and materials resources are used.
- ***Stakeholders' Fatigue.*** Engaged stakeholders are better informed and more productive, while fatigued stakeholders are prone to underperform, and eventually disengage.
  How SEA2SEE addresses this consideration: SEA2SEE will keep stakeholders informed about the evolution in the multi-disciplinary technological and innovation activities, depending on each stakeholder's interest, and set up a clear timeline of information sharing, while supporting and empowering the stakeholders in taking part in the decision-making processes. In countries where similar projects occur, we are engaging with these projects (including the twin project fishEUtrust) and organize common events to minimize stakeholder fatigue.
- ***Stakeholders' expectations.*** The definition and management of stakeholders' expectations is very important for achieving effective engagement and maximizing the benefits of the project.
  How SEA2SEE addresses this consideration: To mitigate the risk of not adequately meeting stakeholders' expectations, a fact that could result in their disengagement, SEA2SEE will: (i) present the objectives of the project and the main activities and outcomes to stakeholders, (ii) clearly define their role across the SEA2SEE technological and methodological advancements and, (iii) iteratively evaluate their expectations and accordingly adapt the stakeholder engagement strategy.
- ***Cultural diversity.*** Cultural factors play a pivotal role in stakeholder engagement for allowing transparency, knowledge sharing, understanding, motivation and active participation[23].

[23] P. Lückmann et al., "The Impact of Cultural Differences on Project Stakeholder Engagement: A Review of Case Study Research in International Project Management," Procedia Comput. Sci., vol. 100, pp. 85–94, Jan. 2016, doi: 10.1016/j.procs.2016.09.127

How SEA2SEE addresses this consideration: SEA2SEE recognizes that there are differences in what concerns the operational environment in which stakeholders belong (e.g., fisheries, food associations and authorities, aquaculture companies, consumers, suppliers, etc.) as well as national cultural differences amongst the participating partners and stakeholders (e.g., France, Spain, Portugal, the Netherlands, Greece, Bulgaria) and adequate tools and methods will be employed.

- ***Conflicts between stakeholders.*** Conflicts may appear between stakeholders because of the different requirements, beliefs, motivations, and expectations.
  How SEA2SEE addresses this consideration: SEA2SEE will provide a systematic way for identifying stakeholders' concerns by investigating their degree of consensus and considering that the conflict resolution should fit into the cultural norms of the targeted stakeholders.

3.3 DATA MANAGEMENT AND GDPR COMPLIANCE

Regardless of the methodology and tools used in the SEA2SEE stakeholder engagement strategy (Section 6), the activities for stakeholder engagement are in accordance with the SEA2SEE Data Management Plan (created within Task 8.5) which describes the application of the FAIR data management principles, data security and ethical aspects of data collection and usage.

In addition, as stated in the Grant Agreement *"The beneficiaries must — at least until the time-limit set out in the Data Sheet (see Point 6) — keep records and other supporting documents to prove the proper implementation of the action in line with the accepted standards in the respective field (if any)."* To ensure alignment with the statements and obligations of the Grant Agreement, all data, and records from the SEA2SEE engagement will be kept for 5 years after final payment.

Ethics surveillance ensures that SEA2SEE activities are ethically compliant with relevant national, EU and international legislation, including the Charter of Fundamental Rights of the EU and the provisions set out in the Grant Agreement, considering the demand for scrutiny of research and development by society and alignment to Responsible Research and Innovation (RRI) principles. In addition, confidentiality is a key element in SEA2SEE stakeholder engagement activities; therefore, each stakeholder is asked whether the information provided should be confidential or they are open and agree to be publicly available. In the case of SEA2SEE open meetings, there is a difficulty in controlling data confidentiality and this is something *a priori* communicated to the stakeholders.

3.4 STAKEHOLDER ENGAGEMENT RISKS AND RESPONSE PLANNING

Stakeholders' engagement is crucial for SEA2SEE successful implementation, adoption, and sustainability; therefore, it is important that potential risks are early identified, qualitatively assessed, and monitored and well-designed mitigation measures and risk responses are in place. Following this approach, in Table 1 the "known- unknown" risks for stakeholder engagement are presented.

Table 1: "Known- unknown" risks for stakeholder engagement table.

Risk	Mitigation Measures
R1. Reluctance of stakeholders (value chain actors and consumers) to participate in co-creation process (Reported in Grant Agreement)	During the stakeholder's identification and assessment process SEA2SEE identifies which stakeholders might be reluctant to participate and the reason behind their reluctance. As a mitigation measure, SEA2SEE considers each stakeholder's internal goals, values and potential positions and brainstorms ways to engage the stakeholder.
Possibility: Low	**Impact:** High
R2. Decreased engagement of SEA2SEE stakeholders *(New identified risk)*	The level of stakeholder engagement will be monitored and re-assessed along the processes of engagement activities and in case of decreased levels of engagement, specific actions for motivation will be offered including attractive communication approaches, participatory activities, project information radiators[24], etc.
Possibility: Low	**Impact:** High
R3. Stakeholders raise concerns on the societal benefits of the technological innovation proposed by the SEA2SEE project. *(New identified risk)*	SEA2SEE respects stakeholder's opinion and beliefs and fosters open and transparent dialogue and discussion for addressing stakeholders' concerns.
Possibility: Low	**Impact:** Low
R4. Possibility of nationwide lockdowns due to unforeseen events, e.g., COVID-19 (Reported in Grant Agreement)	In case of future lockdowns, the stakeholder's engagement strategy is accordingly adapted to virtual meetings, online focus groups and utilization of other online tools, such as the Organizational Change Management (OCM) software tool.
Possibility: Medium	**Impact:** Medium

Summarizing, the most critical risks for SEA2SEE stakeholder engagement are the reluctance of the stakeholders (value chain actors and consumers) to participate in the co-creation process and/or their decrease in engagement throughout the project. Therefore, it is of vital importance that their interests, expectations, concerns, and barriers are identified and continuously monitored, and that engagement is adequate and tailored to their needs. Communication tools and methods are used to keep them motivated and positive.

3.5 GENDER CONSIDERATIONS

Gender dimensions and equality considerations are taken into account in the SEA2SEE stakeholder engagement strategy and are addressed in all stages of the SEA2SEE value chain so that diverse behaviors and needs are valued and favored equally. In more detail, the following gender considerations are elaborated:

[24] Large graphical representation of project information kept plainly in sight in the stakeholder's engagement activities

- ***Digital fluency***. Women are a significant source of untapped talent in the global workforce. However, with regards to digital fluency, men continue to use digital technologies more frequently than women[25]. The digital divide could deepen existing gender inequalities; contrariwise, access to digital technology accelerates global gender equality.
- ***Interest in sustainability***. There are gender differences regarding concerns for environmental sustainability. Women seem to purchase more green products, produce less rubbish, put more attention on recycling, more easily adopt responsible behavior and are more open to sustainability adoption.
- ***Impact on the environment*.** Women and men differ in their behavior and attitude towards the environment. This can be attributed to the more modest resources (e.g., lower income), lack of political power, low participation in decision-making processes (regarding climate change and sustainability) and household responsibilities.
- ***Involvement in civil society activities***. Women seem to be globally more active in civil society activities and can undertake several key roles (e.g., seafood sector professionals, decision and policy makers, and consumers).

In addition, SEA2SEE respects and considers the FishWise-led program[26] and the Seafood Alliance for Legality and Traceability (SALT)[27], which integrates gender for raising the visibility of women's roles in seafood traceability activities.

4. PARTNERS ROLE IN SEA2SEE STAKEHOLDER ENGAGEMENT STRATEGY

In this section, a description of the key role and activities of SEA2SEE partners and targeted stakeholder groups is presented.

SmartWater	SmartWater is a Spanish technology company consisted of a multidisciplinary team dedicated to the development of technologies aimed at the aquaculture sector and water quality management. The company's commercial activity is focused on the implementation of technology contracts in Europe, and on the sale of AI-assisted water quality sensor platforms (Medusa), expert systems and algorithms for decision support and management software for production and traceability in aquaculture (SmartWater Cloud). SmartWater is the coordinator of the SEA2SEE project and leader of WP4 using its profound experience in designing cloud architectures, databases, and software as well as in their deployment to perform data capturing, transformation, processing, storing and output. As one of the technology companies in SEA2SEE, SmartWater participates in the traceability technologies development, and the design of the cloud architecture, databases, and software as well as their deployment to perform all the processes of

[25] https://www.unesco.org/en/articles/closing-digital-skills-gender-divide
[26] https://fishwise.org/
[27] https://www.salttraceability.org/

	data capture, transformation, processing, storing and output. Data from SmartWater Cloud, the aquaculture management software from SmartWater, will be sent and stored in the SEA2SEE blockchain based traceability platform.
Key stakeholder groups	SmartWater engages aquaculture producers, distributors, certification bodies and policy makers, logistics companies, consumer universities and other scientific institutions.

Tilkal	Tilkal is a software and IT infrastructure company providing the supply chain traceability and trust platform for Industry 4.0. Tilkal combines a unique B2B blockchain network for secure and provable data sharing, with analytics and scoring algorithms to create an end-to-end, real-time representation of the supply chain. Using Tilkal technologies, fisheries will be able to share data about their production volume, location, and fishing types. Farmers will be able to share information about products and conditions they use to grow fish. Logistics companies like transport facilities or warehouses will be able to share data about shipping and receiving events, conditions of transport (temperature, duration, etc). All SEA2SEE actors of the value chain will be able to leverage the Tilkal platform. Today, in total, the Tilkal network is composed of more than 79 independent nodes, and several hundred companies use it to share data. Tilkal is leading "WP3: Traceability technologies development". Tilkal will provide documentation and technologies for deploying the SEA2SEE traceability platform. This platform makes it easy to onboard stakeholders and allow them to share data and make it available all the way down to the consumers.
Key stakeholder groups	Tilkal approaches different groups of stakeholders having data to share with other traceability actors, including fisheries, farmers, cooperative, logistics companies, retailers, customs, or other public administration, but also scientists and universities willing to share data to improve the quality of the collected information.

PAGE UP	PAGE UP is editor and integrator of mobility and traceability solutions for more than 20 years now. PAGE UP addresses markets with mobility challenges, such as transportation, logistics, quality control and maintenance. PAGE UP participates in innovative projects and has developed partnerships with large companies and research laboratories. In addition, the company offers a range of tailor-made services: custom development, development assistance and integration of AIDC devices (barcode, RFID, IOT, etc.). These skills allow PAGE UP, on

	the one hand, to effectively adapt business applications to the specificities of each client, and on the other hand, to ensure the development of custom solutions when it is necessary or requested. In SEA2SEE, PAGE UP complements the efforts of the other technological partners, provides the Software Development Kit for "WP3: Traceability technologies development" and set of mobile applications for the "WP5: Demonstrations", specifically made to ensure the stakeholders' engagement.
Key stakeholder groups	PAGE UP can involve technical stakeholders such as hardware manufacturers and big software editors that could help to improve solutions. Regarding operational stakeholders, PAGE UP approaches different fisheries, retailers and research institute involved in the food tech.

SUBMON	SUBMON has significant experience in planning and undertaking awareness campaigns to promote a more Ocean literate society. SUBMON educational projects are related to the sustainable use of marine resources to encourage a change in the relationship between humankind and the ocean. SUBMON's strategy includes the engagement of key stakeholders at the local, national, and international levels through training and consultation services to public and private entities. SUBMON has been working with local producers, such as fishermen's guilds, studying the interaction between marine mammals and fishing gear and ensuring a balance between the conservation of marine populations and economic gains, creating a sustainable label for proximity seafood. As it concerns consumer interaction, SUBMON has facilitated informed choices when buying or consuming seafood, working with fish auctions, seafood markets, and local restaurants. SUBMON is leading WP2 to identify and select key stakeholders and implement a consumer engagement strategy. This concerns the identification of consumers' knowledge gaps and barriers related to sustainable seafood consumption and acceptance and create solutions to overcome them. Building on these results, a set of actions will be undertaken to raise awareness of sustainable seafood consumption and to overcome barriers to consumer acceptance and trust. Activities addressed to consumers, such as a Hackathon, a MOOC, several pilot activities, and the production of awareness materials, are envisaged.
Key stakeholder groups	SUBMON identifies and engages with consumers (individuals and segments) in the traceability chain's final piece. Examples of these groups are consumer clusters, supermarkets, public seafood markets, HORECA representatives, public administration, public and private canteens, cooking schools, Knowledge Brokers, consultancy and advocacy organizations or individuals, NGOs, representatives of twin

	and similar projects, established networks, media (local & national press agencies, TV & Radio shows), Food and Sustainability influencers (seafood ambassadors, Food influencers and writers).

CCMAR	CCMAR (Centro de Ciências do Mar) is an independent research organization (non-profit association) located in Faro (Algarve, Portugal). CCMAR legal associates are the University of Algarve and individual scientists. CCMAR is the premier marine research center in Portugal having repeatedly received the "Excellent" score in evaluations by an international panel (every 5 years, the latest in 2019) promoted by Portugal's National Foundation for Science and Technology. CCMAR research is focused on three thematic lines: Global Environmental Change, Ocean Management and Conservation, and Marine Products and Resources. CCMAR's participation is SEA2SEE is through the Fisheries, Biodiversity and Conservation (FBC) group, whose main objectives are to contribute to the improved management and sustainable exploitation of the multi-species resources of the Algarve coastal waters. CCMAR is actively engaged with Portuguese stakeholders, especially those involved with the Algarve octopus fishery pilot study.
Key stakeholder groups	CCMAR engages with: • Industry: Octopus fishing associations, Vessel owners, Skippers, Auction (DocaPesca). • Authorities: Fishing port authorities, Maritime authorities, Directorate - General for Natural Resources, Safety and Marinetime Services (DGRM). • Scientists: University and Polytechnic, National research institutes (e.g. Portuguese Institute for Sea and Atmosphere (IPMA)). • Consumers and processors: Licensed buyers (at Auction), Processing and Canning companies, Fish market salespersons, Restaurants, Individual consumers.

ANFACO	ANFACO is a private non-profit business association founded in 1904, representing and defending the sectoral interests of more than 250 companies from the marine and food industry network. It also provides high added value services through its technology centre, whose main objectives are to promote the quality, research, and technological development in the marine and food products sector. It is a reference for the development of Research & Development projects in the fields of Digitalization - Industry 4.0, Biotechnology - Health, Sustainability - Circular economy, and Marine

	resources – Aquaculture, generating knowledge that can be later transferred to the industrial sector, improving its competitiveness. ANFACO is leading WP6, focused on Life Cycle Analysis, impact assessment and risk-benefit analysis on seafood consumption. It leads Task 6.2 regarding food safety legislation compliance and Task 6.3 focusing on the evaluation of non-frequent contaminants susceptible to be present in fishery products applied to all SEA2SEE use cases.
Key stakeholder groups	ANFACO is closely working with consumer associations, universities and other scientific institutions related to seafood industry.

NAYS	NAYS cooperates with almost all aquaculture companies in Greece, offering consultative services for sustainable development of the sector for over 20 years and holds a significantly wide network of contacts and acquaintances, covering all parts of the aquaculture value chain and a wide range of stakeholders. NAYS has established networks with experts in private and public institutions regarding the aquaculture value chain in Greece and will successfully manage the deployment of the SEA2SEE solution on the premises of a well-established company with a vertical production scheme and substantial infrastructure. NAYS is leading: (i) Task 1.1. and the definition of a novel SEA2SEE methodology on stakeholders' engagement and (ii) WP5, related to demo planning, implementation, and coordination of the pilot demonstration of the SEA2SEE solution in Central Greece.
Key stakeholder groups	NAYS approaches and engages aquaculture producers (fish farmers, P.O.A.Y. Management Bodies), suppliers (cage/net manufacturers, feed manufacturers etc.), packing and processing facilities' owners, logistics companies, consumer associations, NGOs, administration agencies, public services and institutions, universities and other scientific institutions, mass/social media representatives.

SEAentia	SEAentia is an aquaculture company based in Peniche (Portugal), which aims to produce top quality seafood in the most sustainable manner by combining novel aquaculture engineering with scientific research. SEAentia is pioneering corvina (*Argyrosomus regius*) production from hatchery to commercial size in a Recirculation Aquaculture System (RAS), where animal welfare is a priority. SEAentia will provide its

	pilot installations to test the sensory equipment that will provide the data for the blockchain platform. SEAentia also has an extensive network of potential stakeholders, nationally and abroad, which can be used for the benefit of the project. SEAentia will mainly engage Portuguese stakeholders, especially those from the logistics and retail supply chain (Task 1.1) and will also support the development of educational campaigns to raise awareness for sustainable seafood (Task 2.2).
Key stakeholder groups	SEAentia shall engage throughout the SEA2SEE activities Academia & R&D: (i) Universities, R&D institutes, private sector R&D, (ii) Authorities: Port authorities (DocaPesca), (iii) Directorate-General for Maritime Policy (DGPM), (iv) National funding authorities: EEA Grants Portugal, (v) Industry: fishfeed companies, (vi) Aquaculture producers association (APA) and (vii) Fish processing companies.

LA	LA (Landing Aquaculture) is a designer, supplier, and researcher of land-based aquaculture technology. LA has conducted land-based aquaculture projects in more than 30 countries over the past 8 years and is constantly engaged in research and development projects and activities. Related to SEA2SEE, LA can implement, monitor, and test the sensory equipment that will be used in the project. Moreover, LA is well-versed in the marketing, welfare, certification, and public opinion challenges around land-based aquaculture systems and engages the public in conferences and social media about land-based aquaculture**.** LA is supporting: (i) Task 1.1 by identifying European stakeholders in the land-based aquaculture supply chain (ii) Task 2.2 by developing online course content, producing awareness raising material, (iii) Task 2.3, (iv) the Portugal pilot in demonstrating the application of the SEA2SEE technology in an innovative, land-based aquaculture farm.
Key stakeholder groups	LA approaches and engages entrepreneurs, fish farmers, consulting companies and technology suppliers who work in the land based, recirculating aquaculture and aquaponics sectors across Europe. LA also has access to universities and research centers, all over Europe, which conduct R&D in land-based aquaculture.

UAVR	UAVR (University of Aveiro) is one of the most dynamic and innovative universities in Portugal. The UAVR integrates (since 1998) the European Consortium of Innovative Universities (ECIU), a leading international cluster of research-intensive universities, with a collective emphasis on innovation, creativity, and societal impact driving the development of a knowledge-based economy. Each member institution shares

	several distinctive characteristics with a strong commitment to innovation and applied research, with close links to industry partners. UAVR leads WP1 and is actively engaged with Portuguese stakeholders, especially those involved with the Algarve octopus fishery pilot study.
Key stakeholder groups	UAVR approaches and engages stakeholders at the local, national, and international levels, including: (i) Fishing industry (fishing organizations and cooperatives, fishers, skippers, vessel owners), (ii) First sale/auction authority (DocaPesca), (iii) Buyers and auction, (iv) Local and national transforming, processing and canning companies, (v) National fishing authorities (Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos; DGRM), (vi) academia (universities and polytechnics), research centers focused on the marine environment, and marine national research institute (Instituto Português do Mar e da Atmosfera; IPMA), (vii) national and international NGOs, (viii) Fish market sellers, restaurants and consumers.

VITAGORA	VITAGORA is a food innovation cluster and professional association based in Dijon, France. Vitagora facilitates an innovation ecosystem of 650 members from France and throughout Europe. These members collaborate on joint actions and R&D projects related to three key areas of scientific and technological excellence. These areas respond to increasing consumer demand for wellness through food: targeting eating pleasure, physical health, but also the link to our environment, addressing sustainable agri-food industry practices. As an international innovation cluster, VITAGORA is involved in the set-up and follow-up of EU-projects, putting at the service of these projects its expertise in the communication and dissemination of agrifood trends and innovation in the industry and in stakeholder rallying and engagement. VITAGORA is leading Task 7.4. to ensure cooperation with stakeholders and other relevant projects and initiatives to leverage potential synergies at EU and national level. These synergies take the form of cross-communication and joint activities, such as joint participation as speakers at events, co-organization of events, cross-project demonstrations, among others, with identified relevant stakeholder groups.
Key stakeholder groups	VITAGORA has established networks with different stakeholders identified in the Synergy Plan, namely similar ongoing projects, European initiatives, and European Clusters. Likewise, Vitagora approaches and engages relevant members within its network and its partners, such as food industries, clusters, European initiatives and organizations, universities, and research centers.

Ethic Ocean	Ethic Ocean is an environmental non-profit organization dedicated to the preservation of the ocean and its precious resources. Its mission is to mobilize the different seafood value chain actors (fishermen, fish farmers, wholesalers, retailers, fishmongers, and chefs) by supporting them in the implementation of sustainable practices. Ethic Ocean plays an active role in the definition of a novel SEA2SEE methodology on stakeholders' engagement, in the mobilization of the different seafood value chain actors, including the end consumers and in the promotion of the project and the dissemination of its results to the stakeholders and the public.
Key stakeholder groups	The key stakeholders attracted by Ethic Ocean are: • Public institutions: Ministries, Biodiversity Agency, regional and local authorities. • Universities and professional training centers (cooking schools and fishmongers' schools). • Industry Production: Fisheries, fish farmers, National association of farmers and fish farmers. • Sales: Major retailers, wholesalers, seafood suppliers and processors, fishmongers, catering restaurant services, chefs, restaurants owners. • Association of consumers.

EP	EP (Europroject) is a consulting company based in Sofia, Bulgaria, highly specialized in the setting-up and management of innovative EU projects. It has become a recognized innovation support partner by also providing professional expertise in communication, dissemination, and exploitation to ensure a wider impact of the more than 30 past and current EU projects in its portfolio. EP is the leader of "WP7: Communication, Dissemination and Outreach", supporting maximum project visibility, public acceptance, and distribution of results once they start becoming available. EP is establishing the SEA2SEE communication tools and channels, developing the communication and dissemination plan, implementing campaigns with project partners, assisting with expanding the network of relevant stakeholders, by engaging: (i) multiple actors from other ongoing EP projects, (ii) EP past and prospective partners, e.g., industry, research institutes, universities, public bodies, SMEs, and NGOs from all over Europe, in the topics related to SEA2SEE project.

	Moreover, EP is directly involved in targeting variety of stakeholders through the SEA2SEE communication and dissemination activities and collaborating with WP1 and WP2 (regarding consumers' and other stakeholders' engagement).
Key stakeholder groups	EP engages with the public, related FARM-2-FORK initiatives and projects, researchers, and scientists in related fields from public and private sector, organizations, public institutions, and business companies interested in food sustainability, digital solutions for food traceability, blockchain as a platform for seafood and food traceability across the value chain.

ANP|WWF	ANP|WWF has established networks and cooperates with almost all fishing Industry, and experts in private and public institutions in Portugal since 2014 and especially during the last 6 years, where participated in the Project Fish Forward. This project was a pan-European project raising awareness of social and environmental impacts of fish consumption. WWF and EJF teamed-up with partners in Europe and two developing countries to drive the European market and global fisheries in a more sustainable direction. ParticiPESCA is a project led by ANP|WWF in partnership with IPMA, CCMAR and EDF, financed by EMFF and with co-financing by Oceano Azul Foundation, which intends to implement co-management for octopus fishing in the Algarve. ANP|WWF is actively engaged with Portuguese stakeholders, especially those involved with the Algarve octopus fishery pilot study.
Key stakeholder groups	ANP|WWF engages with the following groups of stakeholders: • Industry: Octopus and other fishing associations, Producer Organizations, Vessel owners, Skippers, Auction (DocaPesca). • Authorities: Fishing port authorities, Maritime authorities, Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos (DGRM), Instituto de Conservação da Natureza e Florestas (ICNF), Direção-Geral de Autoridade Marítima (DGAM), Autoridade Tributária (AT). • Scientists: University and Polytechnic (e.g., CCMAR and MARE-IPLeiria), National research institutes (e.g., Instituto Português do Mar e da Atmosfera; IPMA). • Consumers and processors: HORECA, Licensed buyers (at Auction), Processing and Canning companies, Fish market salespersons, Consumers associations (e.g., DECO), Individual consumers.

5. STAKEHOLDER ANALYSIS AND MAPPING

5.1 LEVELS OF STAKEHOLDER ENGAGEMENT

An important step for a successful SEA2SEE stakeholder engagement is the analysis of the different levels. In fact, it is important to note that a variation in the levels of stakeholder engagement exists, which can be attributed to the strategic objectives of relevant groups, geographical distribution, resource availability, as well as other factors. Therefore, to better plan the SEA2SEE stakeholder engagement strategy, the following three levels in stakeholder engagement are being used (Figure 8).

(i) **Level I.** This level includes stakeholders who are "**Informed**", i.e., those who are provided with information related to SEA2SEE. Communication with these stakeholders is one-way.

(ii) **Level II.** This level includes stakeholders, who are "**Involved**", i.e., those who are directly working with SEA2SEE partners throughout the SEA2SEE design pipeline. Communication with these stakeholders is two-way, where both sides exploit learning.

(iii) **Level III.** This level includes stakeholders, who are "**Cooperative**[28]", i.e., those who are driving the research and development of the SEA2SEE solution. This level includes all internal SEA2SEE stakeholders (see section 3.1).

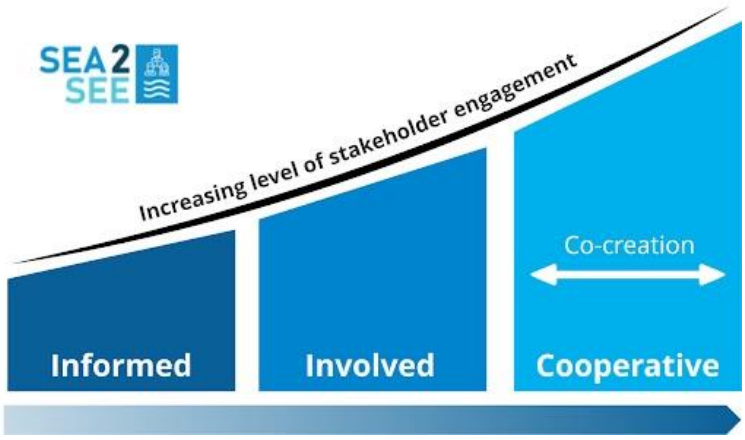

Figure 8: Levels of SEA2SEE stakeholders' engagement.

It may be the case that a stakeholder group presents a different behavior depending on the key SEA2SEE question/area of interest (AoI). A mapping of the SEA2SEE stakeholders in fisheries and aquaculture has been done for the components of: **(AoI1)** ***Building trust through Traceability*** **and, (AoI2)** ***SEA2SEE developed technologies*** (e.g., blockchain-based platform, aquaculture production management software, data management software, mobile application, etc.).

[28] *Throughout the deliverable the terms Collaborative or Cooperative are included to define the same level of engagement*

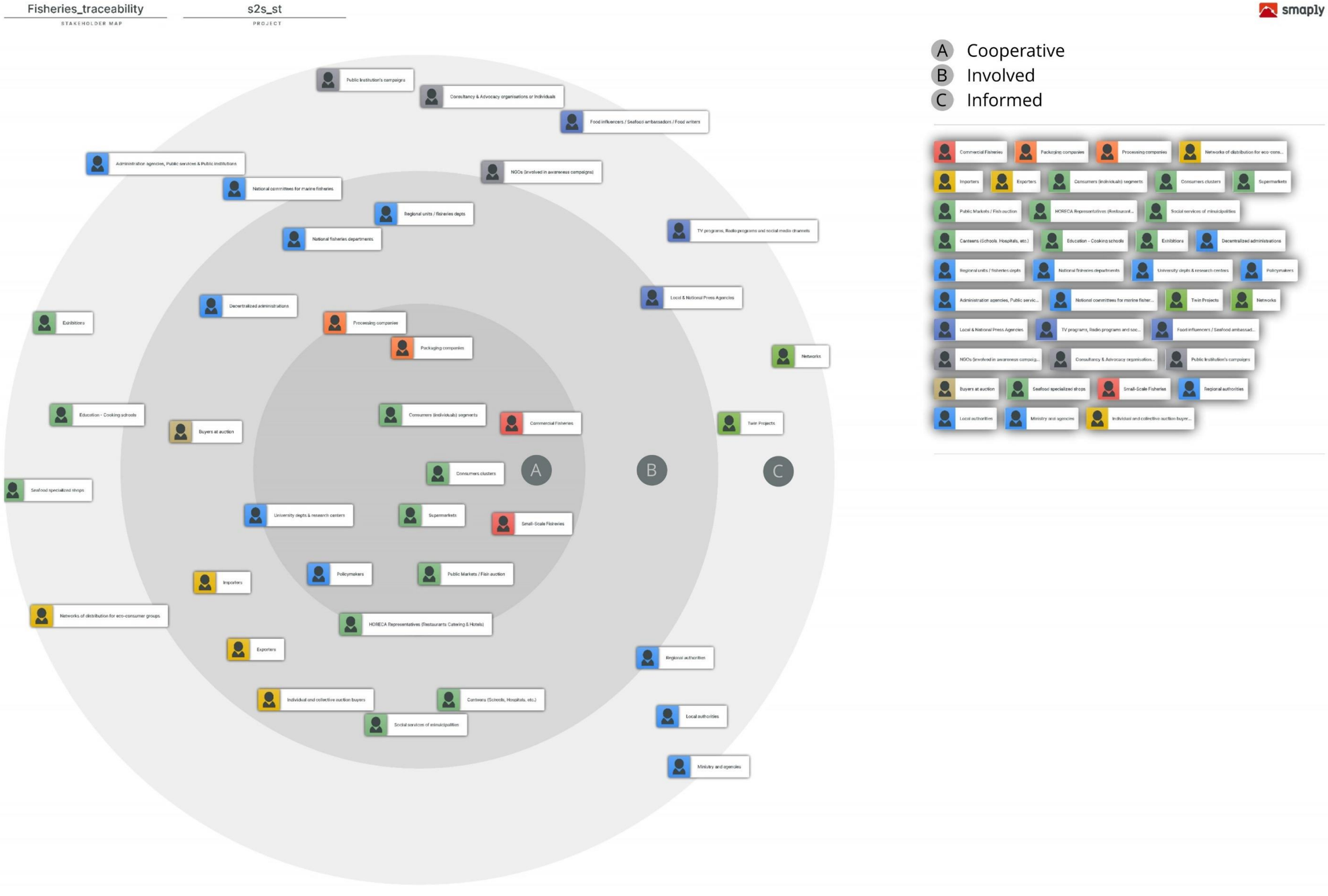

Figure 9: AoI1- Mapping in Fisheries domain**.**

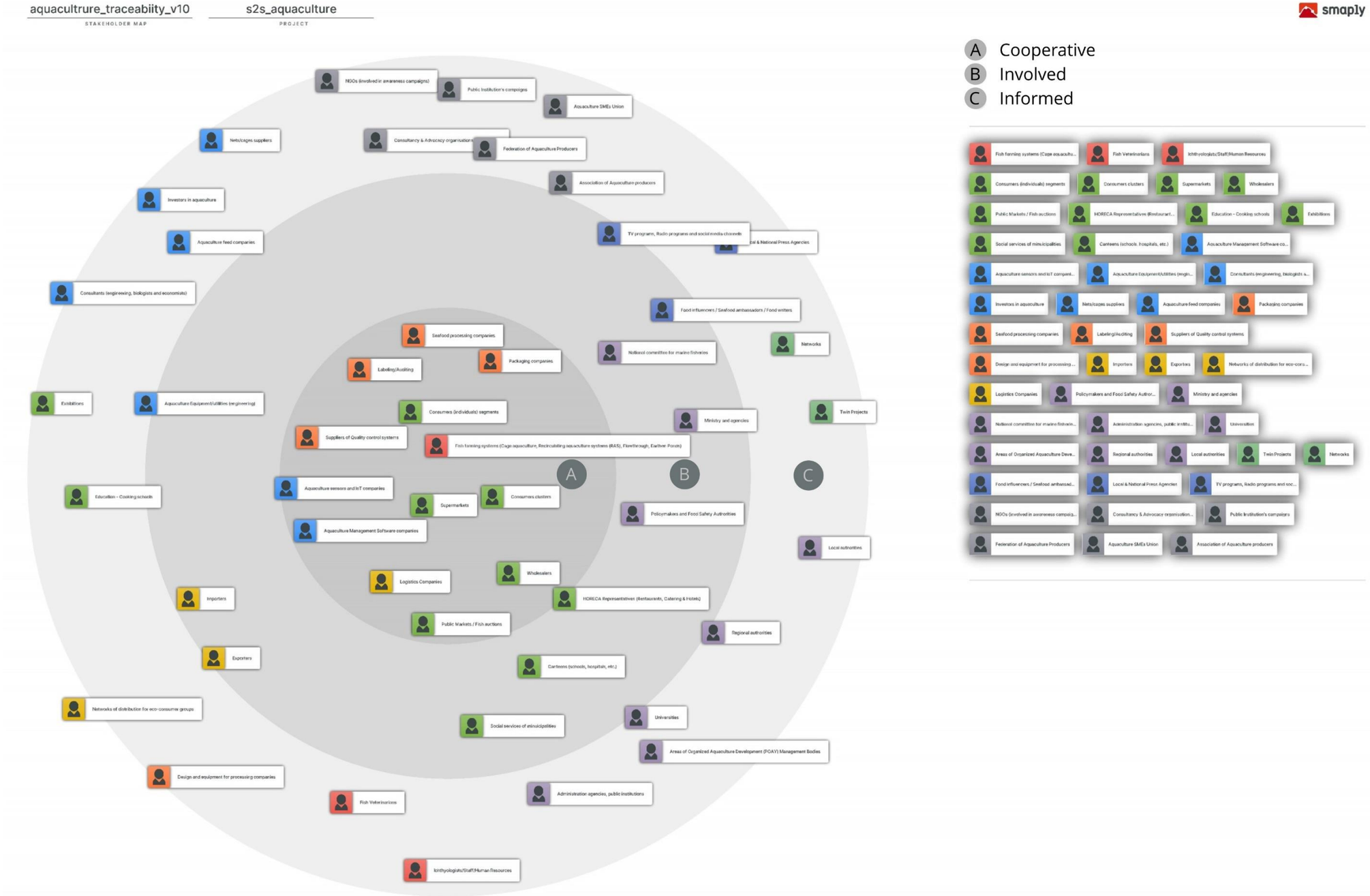

Figure 10: AoI1- Mapping in Aquaculture domain**.**

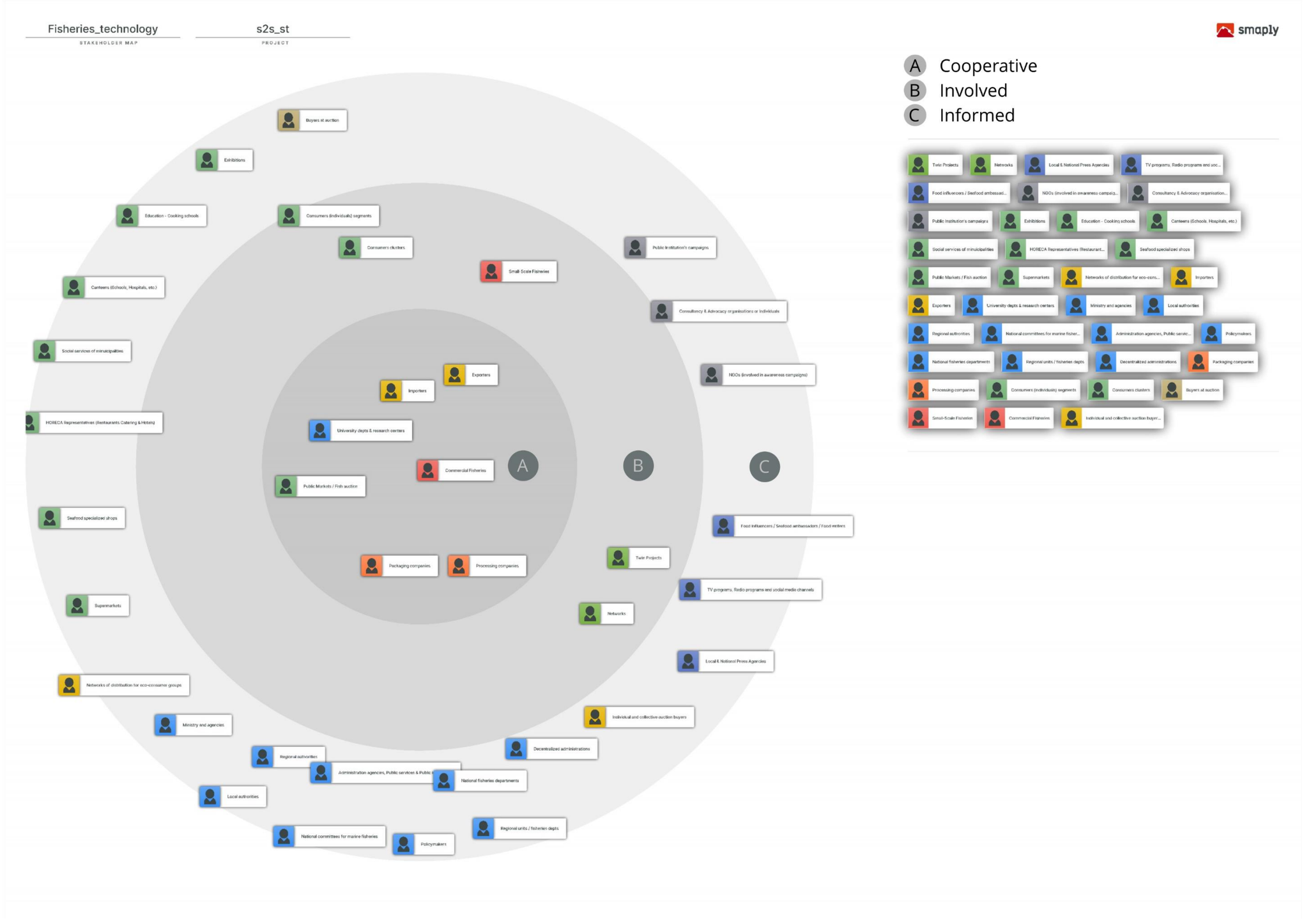

Figure 11: AoI2- Mapping in Fisheries domain**.**

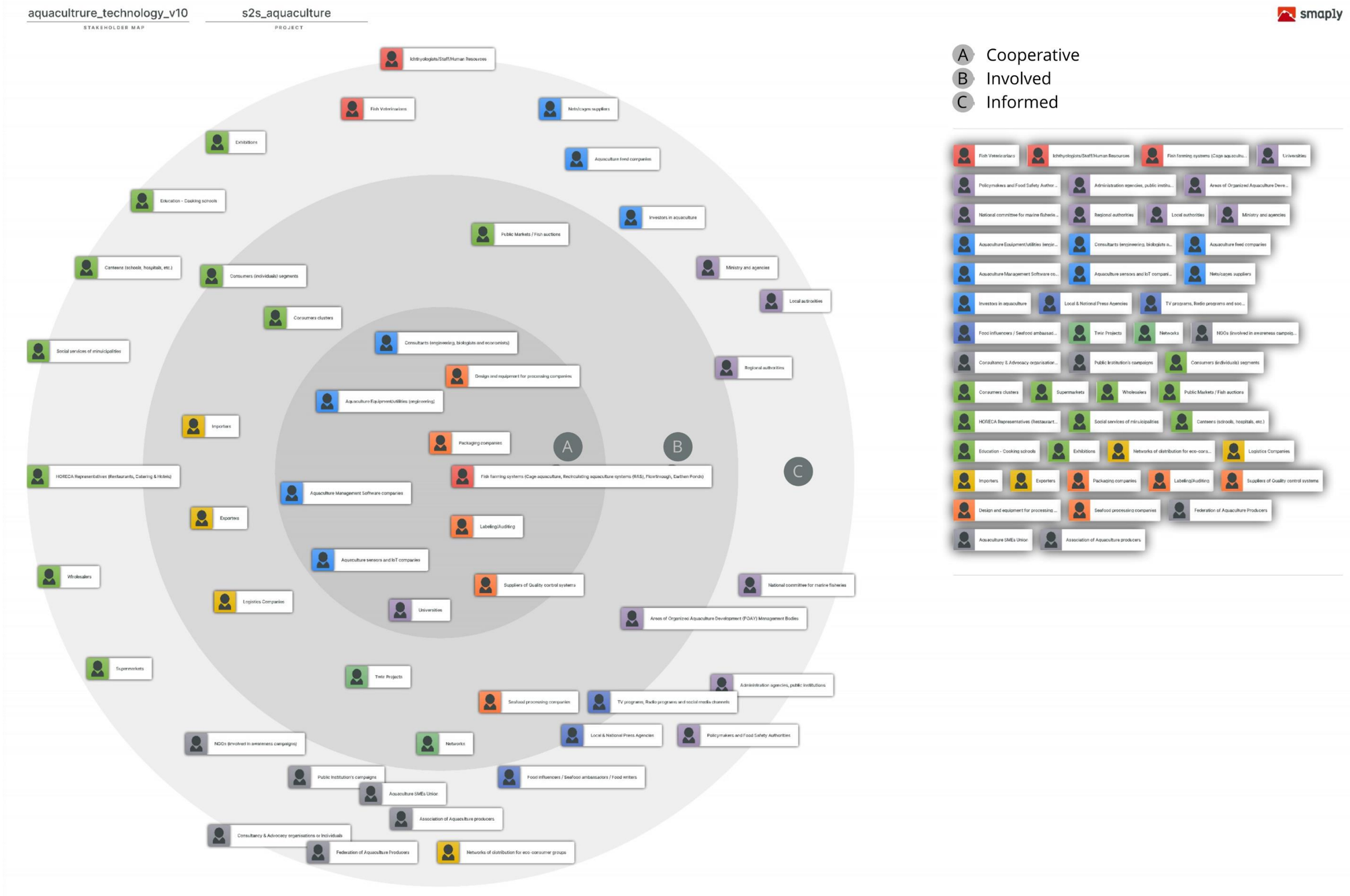

Figure 12: AoI2 in Aquaculture domain.

Regardless of the different levels in which stakeholders belong, and depending on the field of interest, stakeholders are grouped in different categories of power/interest for the aquaculture (Figure 13) and fisheries domain (Figure 14).

The interaction with the stakeholders can be realized in very different ways. For instance, a different approach should be implemented in a stakeholder who is contributing with some data or if he/she is actively involved in the design of the SEA2SEE outcomes. In the case of contribution, the stakeholder will not have a high influence on the outcome, while if the stakeholder is part of the SEA2SEE co-design, his/her influence is expected to be very high.

The analysis of stakeholders is an important process implemented at the start of the SEA2SEE project to avoid/minimize any issues and risks (see section 3.1, section 3.4). This analysis aims at understanding and evaluating the targeted stakeholders and define their relevance to SEA2SEE which in turn is a driving force for their position, interest, influence, and sustainable engagement.

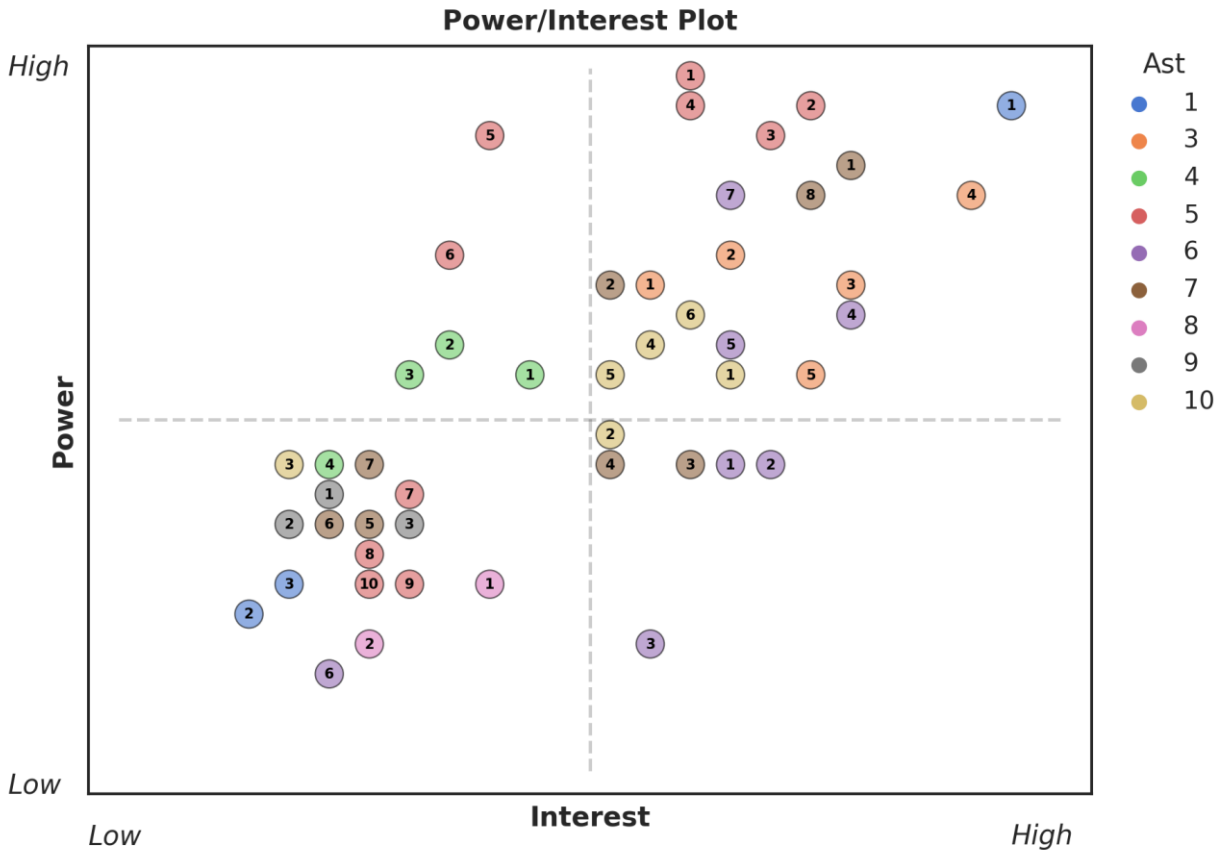

Figure 13: Power/Interest matrix mapping of stakeholders in SEA2SEE engagement strategy- Aquaculture domain.

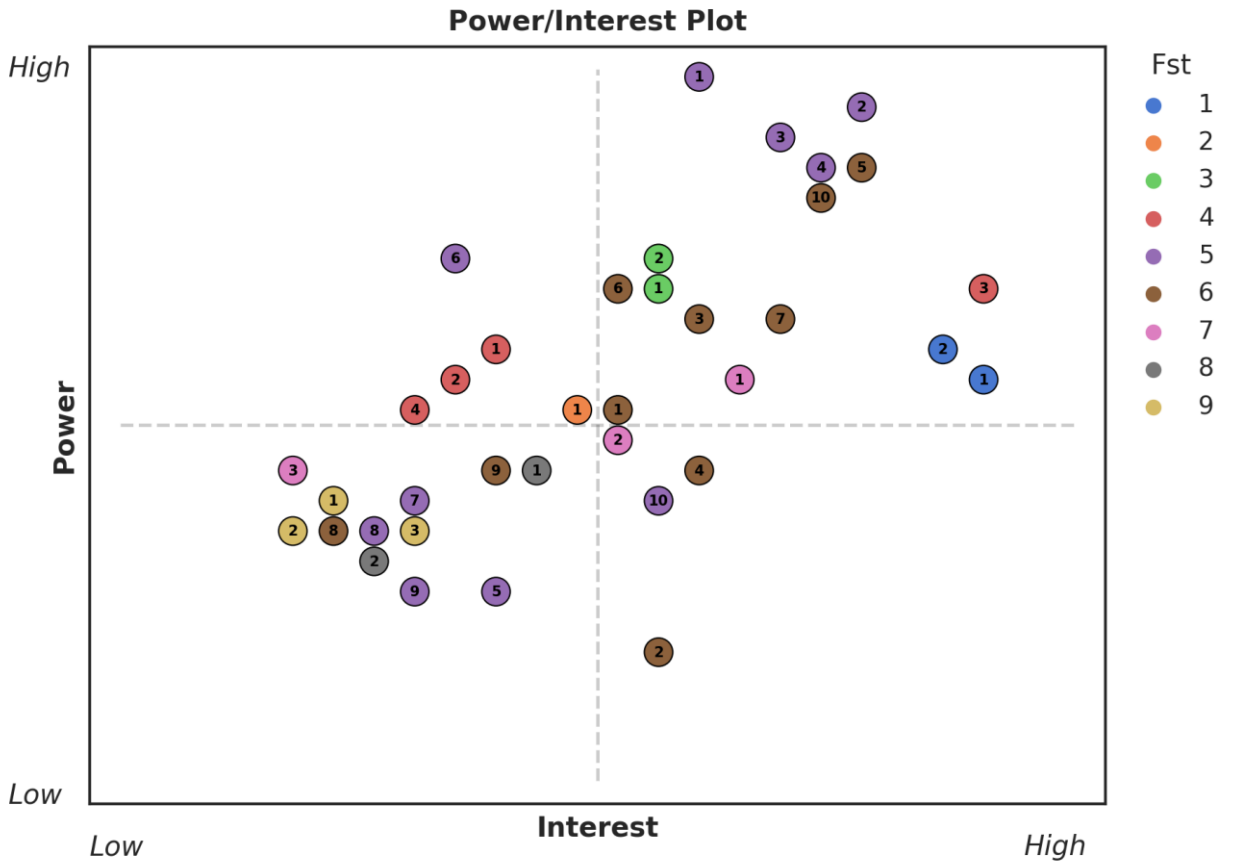

Figure 14: Power/Interest matrix mapping of stakeholders in SEA2SEE engagement strategy- Fisheries domain.

5.2 BENEFITS OF THE SEA2SEE STAKEHOLDER ENGAGEMENT STRATEGY

The stakeholder engagement strategy of SEA2SEE aims at enabling the promotion of science and technology and linking them to society, as well as to tailor the different project activities to the needs of the different groups of stakeholders. These benefits can differ depending on the type of stakeholder. By actively engaging the targeted stakeholders, the different components of the SEA2SEE solution are being designed, developed, and become tailored to the specific needs of each group, increasing the potential that the expectations of the stakeholders are met and that the benefits as well as the impact of the SEA2SEE are maximized. In addition, the targeted stakeholders are being used as a means for knowledge and learning transfer to be applicable in their everyday practice, increasing in this way the social benefits. In the following table, a preliminary representation of the benefits for the internal and external stakeholders is presented.

Table 2: SEA2SEE stakeholders' benefits.

BENEFITS	Levels of Stakeholder Engagement		
	Informed	**Involved**	**Cooperative***
Internal Stakeholders	High visibility of the SEA2SEE outcomes linked with high reputation and establishment of new networks	Improved potential for new project collaborations	Availability of answers to key questions related to blockchain technology demonstration
	Wider dissemination of the SEA2SEE outcomes associated with enhanced impact	Opportunity for knowledge sharing and expansion	Delivery of acceptable SEA2SEE final outcomes
		Potential for adoption of improved methodologies and tools	
External Stakeholders	Access to integrative knowledge related to SEA2SEE technologies and methodologies and sustainability concept	Enhanced awareness, trust and behavior change with respect to the responsible production, consumption, and disposal of seafood	Shared responsibilities and decision making Tailored and stakeholder oriented blockchain models, Apps for consumers and Smart management systems.
	Improved sustainability guidelines to the industry and policymakers		
	Increase in the added value of the products, as will offer a smart – innovative traceability process	Early actuation and tendencies analysis of market production and consuming habits which will impact and empower the fish farmers for a quick adaptation of their production planning	

**Throughout the deliverable the terms Collaborative or Cooperative are included to define the same level of engagement.*

6. SEA2SEE STAKEHOLDER ENGAGEMENT METHODOLOGY

6.1 BUILDING TRUST AND MOTIVATION

Trust building is a fundamental aspect of stakeholder engagement. In SEA2SEE, obtaining sufficient levels of trust in the sustainability of seafood traceability, in the development of innovative end-to-end blockchain models and professional and consumer applications is a challenging task. To address this challenge, the factors which SEA2SEE has recognized to contribute to trust are the following: (i) the impact that the SEA2SEE outcomes will have on affected stakeholders and social well-being, (ii) the degree and quality of communication established between SEA2SEE partners and the interested stakeholders, (iii) the fairness and transparency of procedures governing the SEA2SEE activities in relation to the stakeholders' interests. In addition, SEA2SEE stakeholders are interested in different aspects and outcomes of the SEA2SEE project, perceive the same project information in a different way due to differences in their environment, values, background knowledge and experience and as a result their motivation also diverges. Therefore, in parallel to the importance of building trust, in SEA2SEE, for each stakeholder, the underlying motivation is recognized, analyzed, and evaluated as a critical step for establishing meaningful and strong relationships and building trust.

In addition, the multi-dimensionality of trust in SEA2SEE is investigated in three dimensions, in accordance to Ceglarz *et al.* [29][6]: (i) *Interpersonal trust*, defined as "the mode of interpersonal relations embedded in a complex network of social relations and norms", (ii) *Generalized trust,* emerging from shared beliefs and values, based on past experiences and existing benchmarks and, (iii) *Institutional trust,* defined as the context of public institutions engagement in policies, and appropriate sustainability guidelines for seafood products. For achieving trust building in SEA2SEE, a good alignment between the objectives, interest, and power between the proposed solution and the stakeholders is applied, while considering all the challenges and issues which may arise.

6.2 CO-CREATION

As a sustainability-oriented innovation project, SEA2SEE seeks to facilitate and empower the legitimacy of technological and IT processes by engaging stakeholders and enhancing co-creation, based on the stakeholders needs, expectations, and drivers of behavior to ensure a clear link between sustainability and traceability of EU seafood value chain, in real-time. Co-creation, in the context of SEA2SEE, refers to the design process in which input from the targeted stakeholders plays an important role during the different phases of the project; from the design phase and later to demo sites implementation, LCA analysis, etc. A wide range of stakeholders, including aquaculture producers, fishers, fisher Representatives, private and public authorities, suppliers, policy makers etc. shall be treated as members of the SEA2SEE creative team. Through co-creation, all stakeholders provide real answers to actual questions and emerging challenges

[29] A. Ceglarz et al., "Understanding the role of trust in power line development projects: Evidence from two case studies in Norway," Energy Policy, vol. 110, pp. 570–580, Nov. 2017, doi: 10.1016/j.enpol.2017.08.051

through an open dialogue and reflection of each stakeholder group's unique perspective. In more detail, the SEA2SEE co-creation approach includes the following phases (Figure 15):

(i) *Co-design phase*: The objective of the co-design phase is to define the ground rules and principles for the stakeholder's co-creation approach. This concerns the definition of the expectations that the SEA2SEE stakeholders have from their engagement and the agreement on the process to be followed. Once the ground rules, terms and conditions of the co-creative relationship have been established, the SEA2SEE partners define the list of the project areas of stakeholders' interest.

(ii) *Co-production phase*: The objective of the co-production phase is to collaboratively work on the agreed SEA2SEE areas of stakeholders' interest. This phase concerns the discussion and review of the initial SEA2SEE results and methodological approaches.

(iii) *Co-delivery phase*: The objective of the co-delivery phase is to develop the individual tools and services required for the SEA2SEE blockchain-based platform and deliver them to the SEA2SEE stakeholders. Special emphasis is put on engaging the stakeholders in knowledge discovery and iterative feedback provisioning to the SEA2SEE partners so that the project outcomes are progressively elaborated towards meeting the stakeholders' expectations.

Figure 15: SEA2SEE Co-creation approach.

The approach of co-creation is expected to result in the encouragement of the stakeholders in the sense of being interested, impacted, and consequently benefited from the SEA2SEE outcomes. This in turn serves as the means for supporting the design of the diverse and innovative results of SEA2SEE, including but not limited to: (i) the SEA2SEE Traceability blockchain data deployment model, in which a Control Tower (web app), serves as a Value chain data collection tool allowing access in real time-shared data blockchain for every seafood value chain actor, (ii) the Aquaculture production management software, which is a data

flow funnel deployed inside the Aquaculture Production Management software's architecture enabling all processes, from capturing data from aquaculture production to storing transformed data in blockchain, (iii) the Blockchain Consumer engagement tool, which is a Consumer App connected to a QR-code sharing life-cycle data on the product for the final consumer, (integrating consumers feedback), (iv) the Demonstrators Toolkit, etc.

6.3 METHODS FOR ENGAGEMENT

Once the SEA2SEE stakeholders have been identified (Section 3.1), the stakeholder engagement plan is developed. Based on these previous exercises, there are several groups of stakeholders defined. It is neither practical, nor smart to engage all identified groups on the same level of intensity, using the same approach. In fact, the engagement methods need to be tailored to each specific group from the value chain – e.g., from fishermen and aquaculture producers to seafood retailers, distributors, and policy makers – as well as to the specific geographical pilot test sites (France included).

To develop the suitable engagement approach/strategy towards the active involvement of different end to-end seafood value chain actors in SEA2SEE demonstration activities, the matrix level of power/ interest was used.

Table 3: SEA2SEE Engagement approaches depending on stakeholder's level of power/interest.

Level of interest/ Level of power	Engagement approach/Strategy	Details	Example of SEA2SEE stakeholders in aquaculture and fishery seafood value chain
High power/ High interest	Cooperate	These stakeholders represent the highest priority for the project (key players) since they have the biggest impact on the project's success. They must be kept fully, regularly, and actively engaged. They need to get exactly what they need to remain happy with the progress of the project.	Fishery: Various EU fisheries, Packaging companies, Public markets/fish auctions, Ministry and agencies Aquaculture: Fish farming systems, Seafood pro-cessing companies, Consumers (individuals) segments, Ministry and agencies

Low power/ High interest	Keep involved	These stakeholders represent a moderate priority for the project. SEA2SEE project team needs: (i) to keep them adequately informed to sustain their interest (ii) to consult them on their area of interest.	Fishery: Fishing organization, Exhibitions, Regional units/fisheries departments, NGOs (involved in awareness campaigns) Aquaculture: Universities, Aquaculture Equipment/utilities (engineering), Consultants (engineering), Aquaculture feed companies
High power/ Low interest	Keep informed	These stakeholders represent a moderate priority for the project. They must be kept sufficiently informed about project progress and results. Communication needs to be intelligently planned to avoid information overload. The goal of the engagement approach is to increase their level of interest in the project.	Fishery: Importers, HORECA Representatives (restaurants, catering and hotels), Administration agencies, Public services and Public institutions Aquaculture: Importers, Public markets/Fish auction, HORECA Representatives (restaurants, catering and hotels), Administration agencies, Public institutions.
Low power/ Low interest	Keep informed	These stakeholders represent the lowest priority for the project. They don't need to be overloaded with communication and not too much effort has to be put into communicating with them.	Fishery: Seafood specialized shop, Regional authorities, Public institution's campaigns, National and local press agencies Aquaculture: Veterinaries, Education-Cooking schools, Networks, TV/Radio programmes

6.4 SEA2SEE ENGAGEMENT TOOLS

The previous steps – setting the goals and finding the approach - led to the final step of preparation – identifying the technique that matches the engagement strategy and level of ambition of the stakeholder

engagement. In SEA2SEE stakeholders' engagement strategy, there is no "*one-size-fits-all*" approach and appropriate tailoring is implemented. For instance, it may be the case that the SEA2SEE partner and the targeted stakeholder have been collaborating in the past and a relationship of mutual respect and trust has been established and in such a case, there may not be the need for application of formal processes. However, in case of a new stakeholder being engaged in SEA2SEE, there is a need for explicitly broadcasting and presenting the project scope utilizing different communication tools and methods. Recognizing this need, in SEA2SEE we are exploiting several communication tools to engage the identified stakeholders and get feedback from them and communicate to them results, outcomes and messages.

Table 4 presents the identified techniques and frequency of their usage for the different approaches which allow us to define the techniques for each specific stakeholder or stakeholder groups in SEA2SEE. The general SEA2SEE engagement approach includes traditional tools of engagement, such as conferences, meetings, and communication activities, as well as the use of digital tools and social networks as a mechanism for continuous, multidirectional communication.

To guarantee the success of SEA2SEE engagement process and thus of the project, it is necessary to ensure that everyone perceives their interest is included. This creates the feeling of ownership about the outcomes of SEA2SEE, increasing in this way the interest of stakeholders to actively engage with SEA2SEE.

Table 4: SEA2SEE Engagement tools for SEA2SEE stakeholder's engagement levels.

Level of stakeholder engagement	Tools	Frequency
Cooperative	Collaborative workshops, demo-sessions, brainstorming, project review meetings, one-on-one meetings, workshops, focus groups, summits roundtables, dedicated emails	1 month
Involved	Survey/questionnaire, conferences, social media outreach, project website, group emails, newsletter	1-3 Months
Informed	Conferences, one-on-one meetings, social media outreach, project website, group emails, newsletter	3-6 Months
All levels	Social media outreach, project website, group emails, newsletter (for important project developments)	Biannually

Focus on SEA2SEE case studies

Five case studies have been identified in the SEA2SEE project. This focus on case studies is crucial for the project as it would allow for demonstrating SEA2SEE technology with real life data inputs towards

traceability from end-to end of each value chain involved. The success of the engagement process in the case studies is guaranteed through:

- a strong interaction between the different stakeholders (internal and external) in the demonstration activities: multi-stakeholder dialogues, roundtables, collaborative workshops, focus groups and demo sessions (e.g., with the presence of renowned chefs) to be organized for the entire duration of the projects with a frequency depending on each project step. On-site meetings to be prepared in advance through on-line meetings, questionnaires, and brainstorming activities. To meet the expectation of the involved stakeholder, a specific questionnaire to be prepared at the beginning of the engagement process to extrapolate what the different stakeholders would need in the blockchain. Responding to the different stakeholder needs is fundamental to develop an appropriate solution and keep the blockchain tool alive after the project.
- a strong interaction of these participating stakeholders with the wider community they represent (seafood industry actors, public and regulatory/ standardization authorities etc.). Communication material to be shared among the different participating stakeholders allowing them to communicate about the SEA2SEE project, their involvement and to disseminate the project results. Communication material to be tailored to each stakeholder group.

6.5 COMPARISON OF ENGAGEMENT TOOLS

Depending on the different SEA2SEE engagement tools and the way these are applied in (written, oral, public procedures), there are certain advantages and disadvantages to be considered (Figure 16).

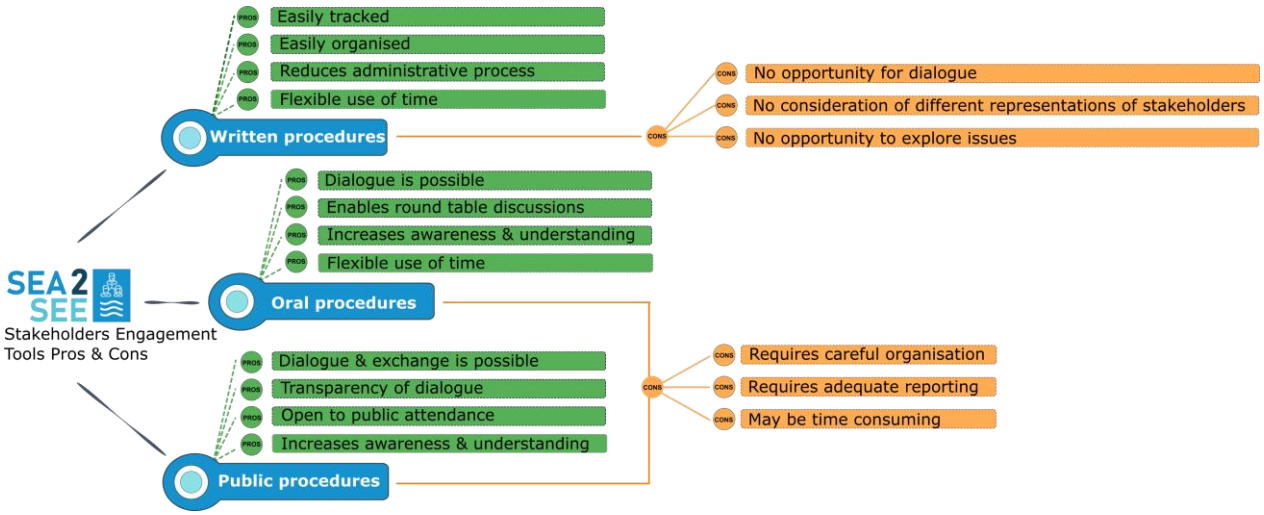

Figure 16: SEA2SEE engagement tools (advantages and disadvantages).

6.6 TIMING OF STAKEHOLDER ENGAGEMENT

Another important aspect of stakeholder engagement strategy is timing. In SEA2SEE, it was decided that the targeted stakeholders are contacted and approached in the early phases of the project to improve and increase the possibility and the ability of receiving their feedback, promoting this way the SEA2SEE concept of co-creation. However, at this point it should be highlighted that depending on the life-cycle phases of the project (definition, specification, research, and validation), different groups of stakeholders are expected to be involved

7. MONITORING AND ASSESSING THE STAKEHOLDER ENGAGEMENT STRATEGY

Monitoring the stakeholder engagement strategy and learning from this process, so appropriate actions are performed in the future, is important.

In the SEA2SEE stakeholder monitoring phase, there are certain key questions to be addressed, among other: (i) *Which engagement method has worked well?* (ii) *To what extent did the employed SEA2SEE stakeholder strategy meet its objectives?* (iii) *How responsive were the stakeholders?* (iv) *Were there some unexpected challenges and how could we have managed them? (v) Are the stakeholders satisfied with the SEA2SEE outcomes?*

On the other hand, the evaluation of the stakeholder engagement is also critical. For instance, evaluation can be used as a means for: (i) demonstrating the value of the SEA2SEE results or changes, (ii) showing how the feedback provided by the targeted stakeholders was used, (iii) evaluating the methods and tools used for stakeholder engagement to have a better understanding of their effectiveness. In SEA2SEE the following types of monitoring stakeholder engagement are considered: (i) *Summative assessment*, in which there is an evaluation of the degree of meeting the stakeholder's specific requests/targets, (ii) *Formative assessment*, which aims to empower the SEA2SEE partners to use the lessons learned from the applied engagement methods and improve in the future engagement activities. Sharing lessons learned not only informs but also reduces the risk and increases the quality of stakeholder engagement. In more detail the following metrics are used: (i) No of SEA2SEE engaged stakeholders, (ii) Appropriateness/Effectiveness of the selected stakeholder methods/tools, (iii) Impact and outcomes of the stakeholder engagement strategy on SEA2SEE project results and stakeholders

In addition, the monitoring and evaluation of the stakeholder engagement strategy is performed in three phases:

(i) *Phase I - Initiation (M1-M6).* In SEA2SEE, we have considered the process of stakeholder engagement evaluation from the beginning of the project and have created the levels of stakeholder engagement and the power/interest classification to be used as baseline data during the following phases.

(ii) *Phase II- Ongoing evaluation (M7- M46).* This phase concerns the tight tracking of the performed activities and the review of the engagement in terms of fit for purpose, timing, effectiveness, etc.

(iii) *Phase III*- Final evaluation (M47-M48). This phase concerns the identification of the practices and processes which worked better in the stakeholder engagement and the timing of the realization of the benefits.

Following these phases, the process of stakeholders' engagement monitoring provides several benefits. More specifically: (i) *Phase I – Initiation.* The creation of the SEA2SEE stakeholder engagement levels and power/interest analysis assist in adequately tailoring the stakeholder strategy. (ii) *Phase II - Ongoing evaluation.* There is an opportunity to make necessary changes and improvements. (iii) *Phase III* - Final evaluation. There is a clear understanding of the SEA2SEE areas in which each stakeholder has contributed and how their input has been used, improving SEA2SEE outcomes, while making the SEA2SEE stakeholders feel valuable and appreciated.

The assessment of the stakeholder engagement method and the utilized tools is fundamental to ensure that the chosen method is successful for the identified stakeholder category. At the end of every event, participants will be interviewed about the success of the organized exchange through an evaluation sheet and their answers and feedback will be analyzed to assess the stakeholder engagement process. The outcomes will allow us to identify the limitations of the chosen method and define the adjustments needed to develop a successful engagement strategy which suits each stakeholder category.

Finally, it is important to underline that stakeholder's power and interest can change over the duration of the project. This means that the stakeholder engagement approach and tools will be periodically reviewed to match the needs and priorities of the stakeholders.

8. CHALLENGES AND LIMITATIONS TO STAKEHOLDER ENGAGEMENT

Despite the inevitable evidence of the benefits and great impact that an effective stakeholder engagement strategy could provide, it is important to be aware of the challenges and limitations that could appear. These include the complexity that could be introduced by the collection and analysis of the needs of diverse groups of stakeholders, or the effort and willingness of the latter to be actively involved in the design of the SEA2SEE solution. In addition, the unbalanced representation of specific stakeholders' groups could result in the expression of the minority which could in turn affect the SEA2SEE design and implementation decision making. However, in SEA2SEE we are not aiming at the strict proportional and quantitative balanced representation in all stakeholder activities, since it may be the case that specific stakeholder groups participate in some of the activities or there may be some stakeholders that are represented, in general, by smaller groups. Instead, we aim to ensure that all key stakeholders can be represented and provide their feedback on the SEA2SEE concept, strategy, processes, and outcomes. Finally, there are also ethical considerations to be considered related to the intellectual property rights (IPR), which need to be *a priori* defined, discussed, and agreed upon to make sure that the involvement of the stakeholders is not expected to cause any implications or issues.

9. CONCLUSIONS

This document is the result of a series of actions performed in the first six months of the SEA2SEE project aiming at establishing a clear, concise, and coherent strategy for stakeholder engagement. Different aspects and considerations of the stakeholder engagement have been identified and analyzed, a detailed identification of the stakeholders in the fishery and aquaculture domain has been realized, along with a classification in different levels of engagement and their mapping in relation to their power and interest. In addition, several methods and tools have been selected to be used for effectively and efficiently engaging the stakeholders. The stakeholder engagement strategy is an evolving process to be adequately adapted based on the needs, expectations, and outcomes of the stakeholder engagement process.

10. ANNEX

This Annex provides a template of the Letter of Interest for the initial contact with the SEA2SEE stakeholders. Additional material to be used is included and presented in the SEA2SEE dissemination and communication plan.

SEA2SEE LETTER OF INTEREST

Dear (Insert name),

I am contacting you on behalf of the Sea2See project funded under the framework of Topic "HORIZON-CL6-2021-FARM2FORK-01-10 - Sea to fork transparency and consumer engagement". Sea2See project develops a novel end-to-end blockchain model and professional and consumer applications aiming to fill in the existing seafood traceability gaps and increase trust and social acceptance of sustainably fished and farmed seafood. In order for this to be accomplished, Sea2See designs, develops and demonstrates innovative technological solutions for satisfying the need for data collection across the entire seafood value chain.

We would like to invite you to join our Stakeholder Registry as we consider your expertise on (Insert e.g., expertise related to Sea2See vision and key areas) related to (Insert e.g., the objective of your planned activity) very valuable and believe that your cooperation could assist us in the realization of Sea2See activities success. We would appreciate it if you could inform us on the possibility of accepting our invitation till (Insert deadline for response), if you would like to accept our invitation.

Please note that joining our Stakeholder Registry is not related to any formal obligations. However, it is very important that the invitation acceptance is followed by an interest in interacting with us through the paths that the Sea2See innovation activities will take. Whether you want to actively participate in our activities or being informed about our activities, you now have the opportunity to make a difference and take advantage of our results.

We are looking forward to hearing from you. If you have any questions, please do not hesitate to contact us anytime.

Best regards,

Table 5: List of identified stakeholders in Fisheries seafood value chain.

ID [st.y.y.y] Group, Subgroup, Specific]	Title
FSt1	**Production**
FSt1.1	**Small-Scale Fisheries**
FSt1.2	**Commercial Fisheries**
FSt2	**Collection from production**
FSt2.1	**buyers at auction**
FSt3	**Processing and packaging**
FSt3.1	**Packaging companies**
FSt3.2	**Processing companies**
FSt4	**Distribution logistics**
FSt4.1	**Importers**
FSt4.2	**Exporters**
FSt4.3	**Networks of distribution for eco-consumer groups**
FSt4.4	**Individual and collective auction buyers**
FSt5	**Sales**
FSt5.1	**Consumers (individuals) segments**
FSt5.2	**Consumer clusters**
FSt5.3	**Public markets/fish auctions**
FSt5.4	**Supermarkets**
FSt5.5	**Seafood specialized shops**
FSt5.6	**HORECA representatives (restaurants, catering & Hotels)**
FSt5.7	**Social services & Municipalities**
FSt5.8	**Canteens (schools, hospitals, etc.)**
FSt5.9	**Education - Cooking schools**
FSt5.10	**Exhibitions**
FSt6	**Administration agencies, public services, public institutions**
FSt6.1	**Decentralized administrations**
FSt6.2	**Regional units / fisheries depts.**
FSt6.3	**National fisheries departments**
FSt6.4	**University depts & research centers**
FSt6.5	**Policymakers**
FSt6.6	**Administration agencies, Public services & Public institutions**
FSt6.7	**National committees for marine fisheries**
FSt6.8	**Regional authorities**
FSt6.9	**Local authorities**
FSt6.10	**Ministry and agencies**
FSt7	**Non-governmental organizations (NGOs), Trade Unions, or others**

FSt7.1	NGOs (involved in awareness campaigns)
FSt7.2	Consultancy & Advocacy organizations or individuals
FSt7.3	Public Institution Campaigns
FSt8	National and European projects and networks
FSt8.1	Twin Projects
FSt8.2	Networks
FSt9	Media & Influencers
FSt9.1	Local and National press agencies
FSt9.2	TV programs, Radio programs and social media channels
FSt9.3	Food influencers / Seafood ambassadors / Food writers

Table 6: List of identified stakeholders in Aquaculture seafood value chain.

ID [Sty.y.y] Group, Subgroup, Specific]	Title
ASt1	Production
ASt1.1	Fish farming systems (Cage aquaculture, Recirculating aquaculture systems (RAS), Flowthrough, Earthen Ponds)
ASt1.2	Fish Veterinarians
ASt1.3	Ichthyologists/Staff/Human Resources
ASt2	Collection from production
ASt2.1	in aquaculture this phase is in st1
ASt3	Processing and packaging
ASt3.1	Packaging companies
ASt3.2	Seafood processing companies
ASt3.3	Labeling/Auditing
ASt3.4	Suppliers of Quality control systems
ASt3.5	Design and equipment for processing companies
ASt4	Distribution logistics
ASt4.1	Logistics Companies
ASt4.2	Importers
ASt4.3	Exporters
ASt4.4	Networks of distribution for eco-consumer groups
ASt5	Sales
ASt5.1	Consumers (individuals) segments
ASt5.2	Consumers clusters
ASt5.3	Supermarkets
ASt5.4	Wholesalers
ASt5.5	Public Markets / Fish auctions
ASt5.6	HORECA Representatives (Restaurants, Catering & Hotels)
ASt5.7	Social services of municipalities
ASt5.8	Canteens (schools, hospitals, etc.)

ASt5.9	Education - Cooking schools
ASt5.10	Exhibitions
ASt6	Upstream components in the aquaculture seafood chain
ASt6.1	Aquaculture Equipment/utilities (engineering)
ASt6.2	Consultants (engineering, biologists and economists)
ASt6.3	Aquaculture feed companies
ASt6.4	Aquaculture Management Software companies
ASt6.5	Aquaculture sensors and IoT companies
ASt6.6	Nets/cages suppliers
ASt6.7	Investors in aquaculture
ASt7	Administration agencies, public services, public institutions
ASt7.1	Policymakers and Food Safety Authorities
ASt7.2	Administration agencies, public institutions
ASt7.3	Universities
ASt7.4	Areas of Organized Aquaculture Development (POAY) Management Bodies
ASt7.5	National committees for marine fisheries
ASt7.6	Regional authorities
ASt7.7	Local authorities
ASt7.8	Ministry and agencies
ASt8	National and European projects and networks
ASt8.1	Twin Projects
ASt8.2	Networks
ASt9	Media & Influencers
ASt9.1	Local & National Press Agencies
ASt9.2	TV programs, Radio programs and social media channels
ASt9.3	Food influencers / Seafood ambassadors / Food writers
ASt10	Non-governmental organizations (NGOs), Trade Unions, or others
ASt10.1	NGOs (involved in awareness campaigns)
ASt10.2	Consultancy & Advocacy organizations or Individuals
ASt10.3	Public Institution's campaigns
ASt10.4	Federation of Aquaculture Producers
ASt10.5	Aquaculture SMEs Union
ASt10.6	Association of Aquaculture producers