

Report on stakeholder assessment / engagement activities

SEARCULAR Deliverable D5.1

Authors: Carolina Alonso, Naia González, Oihane C. Basurko, Elsa Cunde, Anja Alvestad, Julie Grønlund, Iker Zudaire, Maitane Grande, Paule España, Asier Asueta, Maria C. Uyarra

Date: 30/06/2026



SEARCULAR
Circular Solutions for Fishing Gears



Funded by
the European Union



UK Research
and Innovation

Document information

DELIVERABLE NO.:	5.1
DELIVERABLE TITLE:	Report on stakeholder assessment/engagement activities
AUTHORS:	Carolina Alonso, Naia González, Oihane C. Basurko, Elsa Cuende, Anja Alvestad, Julie Grønlund, Iker Zudaire, Maitane Grande, Paule España, Asier Asueta, Maria C. Uyarra
REPORTING PERIOD:	RP2
WORK PACKAGE	5
WORK PACKAGE LEADER:	AZTI
ORGANISATION RESPONSIBLE FOR THE DELIVERABLE:	AZTI
DISSEMINATION LEVEL:	PU - Public
DELIVERY DATE:	30/06/2026
DOCUMENT VERSION:	Version 1

Document history:

Issue date	Version	Changes made / Reasons for this issue
30/06/2026	1.0	Initial version

How to cite | Alonso, C., González, N., Basurko, O.C., Cuende, E., Alvestad, A., Grønlund, J., Zudaire, I., Grande, M., España, P., Asueta A. & M.C. Uyarra 2026. Report on stakeholder assessment / engagement activities. SEARCULAR Deliverable 5.1. 77 pp

The work described in this report was developed under the project **SEARCULAR – Circular solutions for fishing gears** (Grant Agreement number: 101112852; Call: HORIZON-MISS-2022-OCEAN-01; Topic: HORIZON-MISS-2022-OCEAN-01-05). Any additional information, if needed, should be required to:

Project Coordinator:

Oihane C. Basurko – ocabezas@azti.es | AZTI

WP5 co-leaders:

Carolina Alonso – calonso@azti.es | AZTI

Maria C. Uyarra – mcuyarra@azti.es | AZTI

Task Leader:

Carolina Alonso – calonso@azti.es | AZTI

Maria C. Uyarra – mcuyarra@azti.es | AZTI

SEARCULAR has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101112852.



Funded by
the European Union



UK Research
and Innovation

Funded by the European Union under the EU Mission 'Restore our Ocean and Waters'. The project has also received funding from UK Research and Innovation (UKRI). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union, the European Climate, Infrastructure and Environment Executive Agency or UKRI. Neither the European Union, the granting authority nor UKRI can be held responsible for them.

Contents

Document information	2
List of Tables	5
List of Figures	5
Executive Summary	7
Background	9
SEARCULAR aims and related Deliverable	9
Objective of Deliverable D5.1	9
1. Stakeholder engagement strategy	11
1.1 Fostering engagement with stakeholders	12
1.1.1 Engagement document "SEARCULAR Stakeholders Taskforce"	15
1.1.2 SEARCULAR at small-scale events	16
1.1.3 Stakeholders' perspective on circular gears – SEARCULAR experts' interviews	17
1.1.4 Stakeholders' perspective on circular gears – external experts' interviews	19
1.2.1 Training on incremental development products	25
1.2.2 Iterative process for solution development	26
Solution #1 development: Recycled polyamide-based dolly ropes	27
Solution #2 development: Marine biodegradable demersal seine ropes	29
Solution #3 development: Biodegradable FADs (BIOFADs)	31
Solution #4 development: Smart port-based solutions for EOL fishing gears	34
2. Social acceptance of solutions	38
3. Challenges and benefits from stakeholder engagement	45
4. Key conclusions and lessons learned	53
Annex I. Stakeholder engagement agreement	58
Annex II. Questionnaire for direct stakeholder engagement	62
Annex III. Questionnaire design to collect Solutions' leads perspectives on stakeholder engagement for direct stakeholder engagement	66
Annex IV. Questionnaire to collect marine EU funded projects' perspectives on stakeholder engagement	69

List of Tables

Table 1. Summary table including barriers that may hindrance stakeholder participation	13
Table 2. Summary table including the benefits for stakeholders as identified by project partners.....	14
Table 3. Summary table including suggested ideas that could foster stakeholder engagement.....	15

List of Figures

Figure 1. Diagram presenting SEARCULAR 's strategy for stakeholder engagement and the activities	11
Figure 2. Discussions among participants during SEARCULAR internal workshop at the project kick off meeting.	12
Figure 3. Outputs from the internal workshop carried out at the start of the project to identify barriers and potential enablers for stakeholder engagement.	13
Figure 4. SEARCULAR interview with the with the skipper of F/V, carried out onboard by AZTI member of the consortia.	20
Figure 5. Photo taken at the Nor-Fishing conference during the presentation of SEARCULAR, at a moment where WP2 leads interacts with the audience.....	22
Figure 6. Key factors influencing a potential transition from conventional to more sustainable gear.	22
Figure 7. Conceptual model for the iterative product development proposed in SEARCULAR.	26
Figure 8. Screenshot of the template used to record the iterative process within each of the solutions developed.	27
Figure 9. Trawling net arrangement to test the circular dolly ropes (black) against the conventional material (orange).	28
Figure 10. Images of supporting vessels F/V Eguzkiloire (left) and Hermanos Soage (right) that agreed to collaborate with the testing of Solution #1.....	29
Figure 11. Key achievements resulting from the iterative processes carried out between SINTEF and SENBIS, Selstad and F/V Fortuna.	29
Figure 12. Image showing ropes while being measured multiple times onboard along the sea tests in F/V FORTUNA.	30
Figure 13. Co-creation of a prototype of one of the BIOFAD new models.	32
Figure 14. Discussions with the Echebastar staff during the workshop.	33
Figure 15. Images of the waste collection area of BILBAO port.	36
Figure 16. An image during the session allocated to present SEARCULAR.....	39

Figure 17. Keynote presentation from Stephan Kabasci (top) and Roger Larsen (bottom).	41
Figure 18. Round table with external experts in the SEARCULAR final workshop.	42
Figure 19. In person participants in SEARCULAR final workshop (top) and panel of experts and moderator (bottom).	44
Figure 19. Feedback provided by 12 marine EU funded projects as in relation to barriers and enablers for stakeholder movement towards circular solutions.....	52



Executive Summary

This deliverable reports on the stakeholder assessment and engagement activities carried out under SEARCULAR WP5 to support the co-development, validation and social acceptance of circular solutions aimed at reducing marine litter from fisheries. It focuses on how stakeholder engagement was designed, adapted and implemented across the project, and how stakeholder input contributed to the four SEARCULAR solutions: recycled polyamide-based dolly ropes, marine biodegradable demersal seine ropes, biodegradable Fish Aggregating Devices (BIOFAD), and smart port-based solutions for the management of end-of-life (EOL) fishing gear.

The initial engagement strategy envisaged the creation of a broad Stakeholder Taskforce bringing together actors concerned with marine litter and circular fishing gear. However, the low response to the first planned workshop and reflections within the consortium showed that a single cross-cutting format was unlikely to be effective. Differences between solutions (responding to needs from different fishing sectors), value chains, regulatory contexts and stakeholder interests, together with concerns around confidentiality and competing priorities, required a more flexible approach. The project therefore moved towards solution-specific engagement, based on trusted relationships, smaller targeted meetings, expert interviews, questionnaires, workshops and direct collaboration with relevant stakeholders.

Several activities supported this adaptive process. An internal workshop helped identify barriers to stakeholder participation and possible engagement strategies. A dedicated SEARCULAR Stakeholders Taskforce document was prepared to clarify roles, expected commitment, benefits and potential impact, although it was ultimately used as an informative resource rather than a formal agreement. Expert interviews with project partners provided insight into value chains, stakeholder priorities and needs in general and on sustainability terms, operational constraints and relevant contacts for each solution. These inputs informed questionnaires and interviews used to gather stakeholder perspectives on sustainability, circular materials, alternative fishing gears and the conditions influencing uptake.

Stakeholder input contributed directly to the development of the four solutions. For recycled polyamide dolly ropes, interactions with research experts, manufacturers, net makers, fishing vessels and producer organisations supported design choices, assembly options and sea-trial planning. For biodegradable demersal seine ropes, collaboration bio-polymer developers, seine rope producers and fishing vessels supported the full innovation process, including a new bio-polymer recipe, rope production, laboratory testing and sea trials under real fishing conditions. For BIOFADs, project partners built on long-standing relationships with the tropical

tuna sector, leading to co-creation workshops and the development of several biodegradable prototypes for controlled and operational testing. For the smart port-based EOL fishing gear solution, engagement with ports, waste managers, public administrations, recycling companies and international initiatives provided key information on waste flows, logistics, material availability, operational constraints and scaling opportunities.

SEARCULAR also promoted broader discussion on the social acceptance of circular fishing gear through dedicated events, including a session at the MARLICE Forum on marine litter and circular economy and a final hybrid workshop organised alongside the final consortium meeting. These events enabled the project to present progress on the four solutions, discuss technical and socio-economic aspects, and collect feedback from a wider stakeholder community including research, industry, policy, certification, recycling and NGO representatives.

The assessment confirms that stakeholder engagement was essential to make the SEARCULAR solutions technically robust, operationally realistic and more likely to be accepted by end users. Stakeholders helped identify needs, provide materials and data, support design choices, solve technical problems, participate in testing and validation, and define suitable trial conditions. However, sustaining participation was challenging. Main barriers included limited time and resources, difficulties organising in-person meetings, unclear perceived benefits, reluctance to share information, confidentiality or competition concerns, conservative attitudes towards innovation, and mismatches between project timelines and operational priorities. Similar barriers were identified in other EU-funded marine innovation projects.

Overall, SEARCULAR shows that stakeholder engagement is most effective when it is early, targeted, solution-specific and based on trusted relationships. Smaller, focused interactions proved more appropriate than broad multi-sector events, especially where stakeholders had different operational realities or potentially, conflicting interests. Successful co-creation requires time, trust, flexibility, and sustained communication. Projects officers have the potential to play a key role in fostering stakeholder engagement. Future projects should involve key stakeholders from the proposal stage, define clear roles and expectations, allocate resources for engagement, prioritise end-user participation in design and testing, and plan for post-project uptake.



Background

SEARCULAR aims and related Deliverable

SEARCULAR aims at reducing the amount of marine litter and microplastic from the most relevant European fishery contributors (demersal trawlers, demersal seiners, tropical tuna purse seiners) and to introduce circular economy practices within the fishing sector value chain including ports, by fostering behavioural change. SEARCULAR will do this by developing/testing/validating 4 close-to-market sustainable and circular solutions (TRL7-9). Three of the solutions are related to the use of more sustainable materials as alternatives to the traditional non-circular plastic used in fishing gears:

- Solution#1 proposes a dolly rope made of recycled polyamide (rPA) from discarded fishing nets (thus it is focused on circularity and more durable materials)
- Solution#2 is based on certified marine-biodegradable materials for demersal seine ropes (the focus is on less impact gears)
- Solution#3 represents eco-designed biodegradable drifting Fish Aggregating Devices (dFADs) used by tropical tuna purse seine fishery
- Solution#4 proposes an End-of-Life (EOL) fishing gear solution for ports by promoting a replicable management system that enables the pyrolysis of EOL fishing gear for a plastic2plastic application.

Objective of Deliverable D5.1

The objective of this deliverable is to report on the stakeholder assessment and engagement activities carried out within SEARCULAR Task 5.1, and to explain how these activities supported the development, validation and social acceptance of circular solutions to reduce marine litter from fisheries. The deliverable documents the process followed to identify, involve and learn from stakeholders across the value chains linked to the four SEARCULAR solutions. More specifically, this deliverable aims to:

- describe the initial stakeholder engagement strategy and the reasons why it was adapted during the project;
 - document how stakeholder input contributed to the iterative development, testing and refinement of the four SEARCULAR solutions;
 - assess the main barriers, enabling factors and benefits associated with stakeholder participation in SEARCULAR;
- 

- reflect on the social acceptance of the proposed solutions and the feedback received from the wider stakeholder community; and
- draw lessons and recommendations to improve stakeholder engagement in future circular economy and marine innovation projects.

The deliverable therefore has both a descriptive and an analytical purpose. It describes the work carried out under Task 5.1, including stakeholder mapping, expert interviews, questionnaires, workshops, targeted engagement activities and interactions linked to the development of each solution. At the same time, it analyses what was learned from these activities, with particular attention to the practical conditions that facilitate or limit effective stakeholder engagement in innovation processes.

The scope of the assessment covers the four SEARCULAR solutions: recycled polyamide-based dolly ropes, marine biodegradable demersal seine ropes, biodegradable Fish Aggregating Devices (BIOFADs), and smart port-based solutions for the management of end-of-life (EOL) fishing gear. For each solution, the deliverable considers the type of stakeholders involved, the form and intensity of engagement, the contribution of stakeholders to solution development, and the challenges encountered throughout the process.

Finally, this deliverable contributes to WP5 by providing evidence on the role of stakeholders in improving the relevance, feasibility and potential uptake of circular fishing gear solutions. It also supports the wider SEARCULAR objective of promoting circular approaches that are not only technically and environmentally sound, but also aligned with the needs, constraints and expectations of end users, industry actors, public authorities and other relevant stakeholders.



1. Stakeholder engagement strategy

SEARCULAR adopted a progressive and adaptive stakeholder engagement strategy to ensure that circular fishing gear solutions were technically feasible, relevant to end users, and socially accepted. Initially, the project aimed to establish a Stakeholders Taskforce as a central platform for engagement; however, low participation led to a shift towards a more flexible, targeted approach. The strategy was therefore structured around two main pillars: (i) fostering engagement and understanding stakeholder perspectives (Section 1.1.), and (ii) co-creation of solutions (Section 1.2). Engagement activities combined internal reflection, participation in small-scale sectoral events, and targeted interviews with both experts and external stakeholders to capture diverse needs, constraints and expectations across the value chain. In parallel, the co-creation of solutions was carried out with iterative engagement with stakeholders, involving them in the design, testing and validation of four circular solutions. This structured yet adaptive approach enabled continuous feedback, strengthened trust, and enhanced the relevance, acceptance and potential uptake of SEARCULAR outputs (Figure 1).

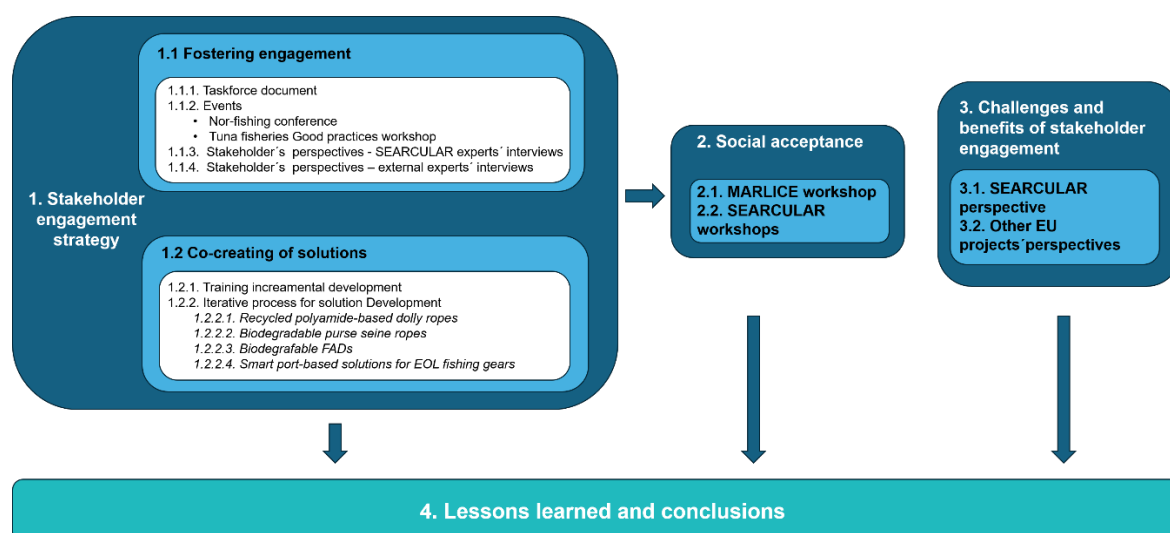


Figure 1. Diagram presenting SEARCULAR's strategy for stakeholder engagement and the activities

1.1 Fostering engagement with stakeholders

A key element of SEARCULAR's stakeholder engagement strategy was the establishment of a Stakeholder Taskforce—a community of stakeholders concerned with marine litter and fisheries that would actively contribute to the co-development of solutions aimed at its reduction. This group was expected to provide feedback and expert advice, while also supporting the uptake and acceptance of these solutions within their respective industries and communities.

To initiate the development of this community, a workshop was planned back-to-back with the kick-off meeting at AZTI headquarters on 23 October 2023. The objective was to identify stakeholders' needs, preferences, and expectations regarding marine litter from fisheries and circular solutions, and to establish a common ground for discussing, developing, and refining the four proposed solutions.

A preliminary list of key stakeholders was compiled based on contacts provided by project partners. These stakeholders were contacted and invited to participate in the workshop; however, due to the low level of acceptance, the event had to be cancelled. Consequently, attention shifted to understanding the reasons behind the limited interest in the initiative. During the kick-off meeting, an internal workshop was conducted in which partners identified potential barriers to participation and explored ways to enhance stakeholder engagement (Figure 2). This reflection was based on: (1) partners' knowledge of the stakeholders they typically work with, and (2) their own experiences when invited to participate as stakeholders in other projects, meetings, or initiatives.



Figure 2. Discussions among participants during SEARCULAR internal workshop at the project kick off meeting.

During the exercise, participants were invited to reflect on the benefits they anticipated from engaging with stakeholders and to share their main concerns about the process (Figure 3).

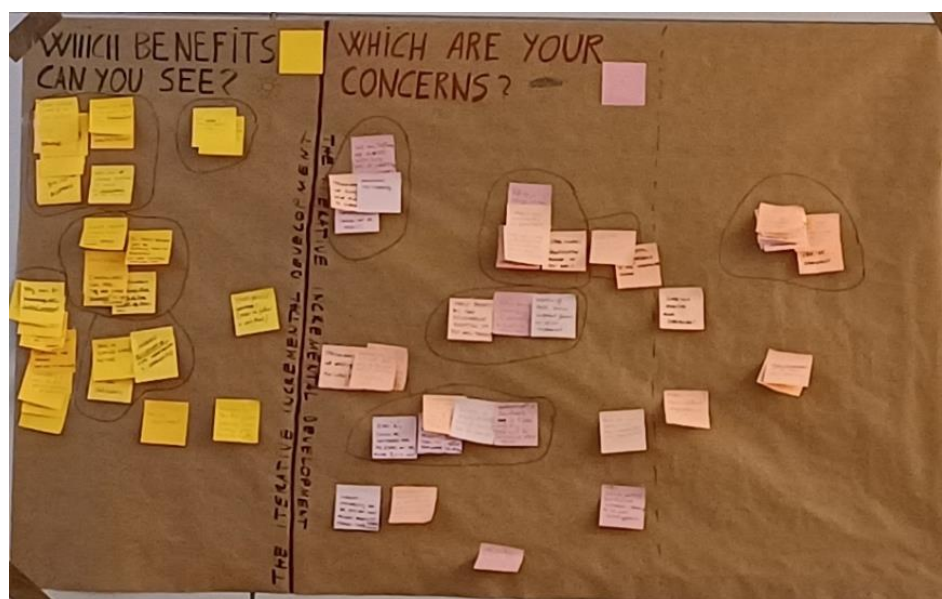


Figure 3. Outputs from the internal workshop carried out at the start of the project to identify barriers and potential enablers for stakeholder engagement.

The following tables (Table 1, Table 2 and Table 3) summarize the conclusions of that exercise.

Table 1. Summary table including barriers that may hindrance stakeholder participation

WHY STAKEHOLDERS MIGHT NOT BE INTERESTED IN PARTICIPATING IN SEARCULAR	
Barrier / Reason	Detail
Lack of relevance / priority	It is not considered part of their core business or strategic priorities
Perceived low benefits	Stakeholders do not clearly see the value or benefits of participating
Time and resource constraints	Lack of staff, too many meetings, workload, or fatigue due to multiple requests
Travel and logistics	Long distances, time and cost of travelling
Poor timing	Busy periods (e.g. seasonal industry peaks)
Engagement sustainability	Difficulty maintaining interest over long projects
Lack of involvement	Not involved from the beginning or not directly affected
Lack of awareness	Limited knowledge of the project or proposed solutions

Unclear role	Stakeholders do not understand their role in the project
Duplication / overlap	Already involved in similar initiatives or projects
Data sharing concerns	Fear of being asked to provide sensitive data
Conflicts between stakeholders	Potential conflicts (e.g. NGOs vs industry)
Reluctance / strategic behaviour	Some stakeholders may delay or resist engagement (e.g. industry interests)
Relationship risks	Partners may fear damaging existing trusted relationships
Lack of networking interest	Low perceived value of participants attending
Wrong contact person	The invited person is not the right one in the organisation
Lack of personalisation	Generic invitations, impersonal communication

Table 2. Summary table including the benefits for stakeholders as identified by project partners.

WHICH BENEFITS COULD THEY GET FROM PARTICIPATING IN SEARCULAR?	
Motivation / Benefit	Approach
Being part of the process	Feeling included in decision-making (especially industry, fishers)
Having a voice	Opportunity to influence solutions and policies
Influence on implementation	Ability to shape real-world applications
Access to knowledge	Understanding technologies, solutions, and concepts (e.g. biodegradability)
Staying informed	Updates on project progress and innovations
Networking opportunities	Building connections with relevant actors
Practical/business benefits	Access to data, waste information, new opportunities
Improved processes	Better waste management or operational improvements
Policy insight	Understanding regulatory challenges and constraints
Empathy and mutual understanding	Better understanding across stakeholder groups
Visibility and positioning	Being seen as active/innovative actor (implicit "label" effect)
Access to specific expertise	Learning from others (e.g. fishers, scientists, policymakers)
Clear tailored benefits	Seeing concrete, stakeholder-specific value

Table 3. Summary table including suggested ideas that could foster stakeholder engagement.

HOW COULD WE ENGAGE THEM?	
Action	Description
Target the right stakeholders	Identify who is truly relevant and interested for each solution
Personalised engagement	Use trusted contacts and personal invitations
Build on existing relationships	Leverage partners' trusted networks
Involve stakeholders early	Include them from initial stages of solution design
Plan well in advance	Especially for industry stakeholders with seasonal constraints
Use existing events	Engage them in events they already attend
Facilitate interaction	Simple tools (questionnaires, feedback loops)
Clarify value proposition	Clearly communicate benefits, roles, and expected contributions
Create smaller working groups	Thematic or solution-specific discussion groups
Organise small, targeted meetings	Short, focused sessions (e.g. 1–2h, by WP or topic)
Reduce participation barriers	Offer online meetings, hybrid formats, or travel support
Make participation attractive	Combine relevance with appealing meeting formats/locations
Ensure continuous communication	Regular updates throughout the project
Manage stakeholder dynamics	Be aware of conflicts and manage participation carefully
Increase visibility	Share participant lists or create community feeling
Empower stakeholders	Give space for them to present themselves and their work
Assign clear responsibilities	Dedicated person per WP/solution for stakeholder engagement

Based on the outcomes of this workshop, several measures were adopted to foster successful stakeholder engagement. These measures were: developing a document to foster engagement, to be present on small-scale events relevant to the Solutions and/or the project, gather the perspective of stakeholders on circular fishing gears through SEARCULAR and external experts. These actions are described in the following subsections.

1.1.1 Engagement document “SEARCULAR Stakeholders Taskforce”

An engagement document entitled “SEARCULAR Stakeholders Taskforce” (Annex I) was developed to clearly define the roles, expected level of commitment, anticipated impact, and associated benefits of participation in the Taskforce. The objective of this document was to promote a more structured

and formalised engagement of stakeholders, while supporting the gradual establishment of a cohesive stakeholder community.

The preliminary strategy envisaged the distribution of the document through the most appropriate representatives within each solution, i.e., those maintaining established and trust-based relationships with the relevant stakeholders. This approach was intended to ensure personalised and effective communication, avoiding direct contact from WP5 and minimising the risk of parallel communication channels that could lead to inconsistencies. Furthermore, it enabled the identification and engagement of the most suitable contact persons within each organisation, based on partners' prior experience and knowledge.

However, this approach proved to be only partially suitable. Several partners had already established bilateral agreements with key stakeholders, often covering broader scopes beyond the SEARCULAR objectives. As a result, they expressed reluctance to introduce additional formal requests or administrative requirements. For example, in the case of Solution #3, efforts were already underway prior to the start of the project to formalise a Memorandum of Understanding enabling AZTI to access historical data from the tropical tuna industry.

In light of these considerations, the engagement document was ultimately disseminated as an informative resource, without requiring formal endorsement or signature from stakeholders.

1.1.2 SEARCULAR at small-scale events

As indicated in Section 1, one concern raised during the internal workshop at the kick-off meeting was that bringing together stakeholders from different sectors could generate mistrust and discourage active participation in a collective event, as they may have conflicting interests. When actors perceive that others at the table may have competing priorities, they may be less willing to share information openly or engage constructively in discussions.

For example, the interests and priorities of the fishing industry often clash with those of policymakers and NGOs, especially in areas such as regulation, resource management, and environmental protection. In such contexts, joint settings may be perceived as arenas of confrontation rather than collaboration, which can undermine dialogue and limit the effectiveness of stakeholder engagement processes.

Similarly, within the consortium, several partners were seeking suitable recycled biopolymers for fishing gear development. As they were, to some extent, competing to identify the most promising materials, this, sometimes, limited knowledge sharing and open exchange of information. Furthermore,

interests and priorities differed significantly across the four SEARCULAR solutions. The trawling, demersal seine, and tropical tuna purse seine fishing industries target different species, operate in distinct geographic regions, and are subject to different regulatory frameworks, economic conditions, and environmental pressures. As a result, their operational needs, challenges, and strategic priorities vary considerably. This diversity makes it difficult to establish a shared agenda or foster meaningful dialogue in collective events, as discussions that are highly relevant for one sector may be perceived as marginal or irrelevant by others.

The situation becomes even more complex when incorporating cross-cutting issues such as the management of EOL fishing gear (solution #4). While this topic is relevant across sectors, it is experienced differently depending on the type of gear, regional infrastructure, and existing practices, potentially adding another layer of divergence rather than facilitating convergence.

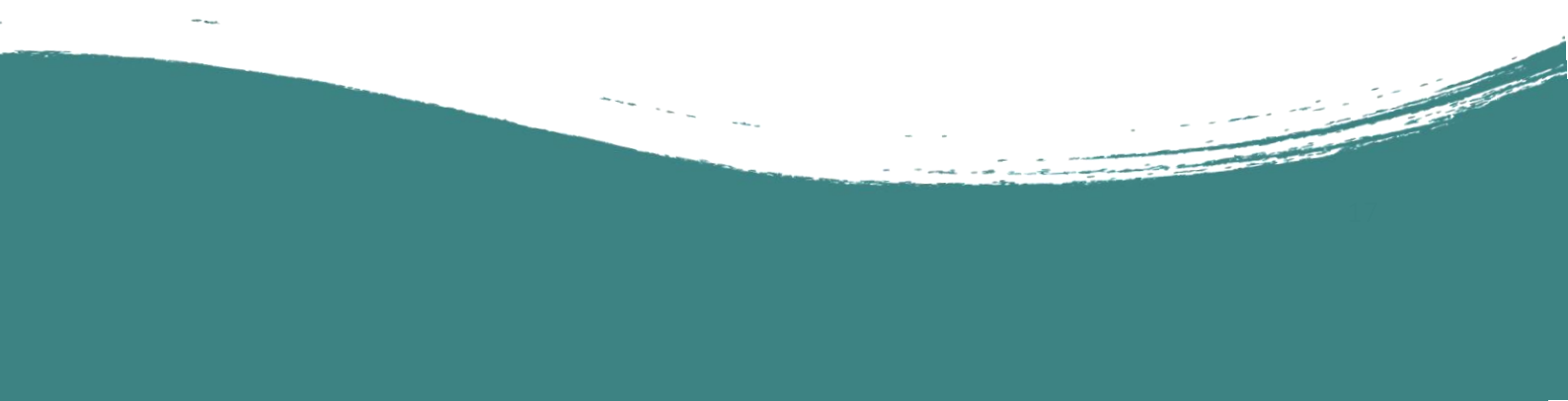
Therefore, we identified some smaller, targeted events where we could present the project, engage directly with stakeholders, and gradually build a network. This network could potentially evolve into a Taskforce, with the aim of developing and testing the proposed solutions and, in a later stage, fostering their social acceptance.

- One of these events was the [Nor-Fishing conference](#) (Trondheim, August 20-22, 2024). SEARCULAR project was presented in a side event with 12 participants from the manufacturing industry.
- Another event was the workshop “Good practices for the tropical FAD tuna industry” organised by ISSF (a subcontractor of AZTI in SEARCULAR) where we could interact with some skippers, shipowners and operations managers from the purse seine tropical tuna fleet.

Outcomes of our participation at this event are reflected in Subsection 1.1.4.

1.1.3 Stakeholders' perspective on circular gears – SEARCULAR experts' interviews

Before any interaction with stakeholders was made, we had some exploratory interviews with experts from SEARCULAR in order to obtain 1) a deeper understanding about the value chain associated with each solution, 2) the challenges that the different stakeholders are currently facing in their activity, and 3) possible contacts of the segments of the value chain.



- Naia González (SARETU) and Elsa Cuende (AZTI) were interviewed for solution #1.
- Anja Alvestad (SINTEF) was interviewed for solution #2.
- Iker Zudaire (AZTI) was interviewed for solution #3.
- Oihane C. Basurko (AZTI) was interviewed for solution #4.

The main challenges that stakeholders face currently, according to the experts' view, are summarized here:

Ship Owners & Skippers

- Profitability pressure due to fluctuating fuel costs and volatile fish prices
- Increasing regulatory requirements and sustainability certifications (e.g. MSC)
- Rapidly changing market demand toward processed products, fillets, and selected species
- Constraints imposed by fishing quotas and resource management policies
- Need for durable gear and efficient maintenance practices
- Ensuring safety and operational reliability on board

Fishers

- Better working conditions (more time at home)
- Need for highly durable gear that minimizes damage, loss, and replacement costs
- Requirement for gear that is easy to handle, reducing effort and improving efficiency at sea

Recyclers & Manufacturers

- Pressure to meet high-quality standards required by shipowners and operators
- Challenges related to the cost and availability of recycled and biodegradable materials
- Technical and logistical difficulties in the recycling process
- Reduced demand linked to the overall decline in fishing activities

Consumers

- High sensitivity to product price and affordability
- Expectation of consistent quality, freshness, and product standards

These conclusions allowed us to develop a questionnaire better designed to address the topics we wanted to investigate while at the same time reflecting the constraints and realities faced by stakeholders (Annex II).



1.1.4 Stakeholders' perspective on circular gears – external experts interviews

In order to gain insight on expectations and potential resistance of stakeholders regarding circular gears, we developed a questionnaire based on the outputs of Subsection 1.1.3. that was distributed through our network of contacts (Annex II). In some cases, the questionnaire also served as an interview script for online or face-to-face meetings with selected stakeholders.

The main objective of the questionnaire was to evaluate:

- Stakeholders' perception and understanding of sustainability
- The importance attributed to sustainability in their decision-making processes
- The factors influencing the choice between conventional and alternative fishing gear

Annex II presents an example of the questionnaire tailored to the fisheries sector; the same structure was subsequently adapted to other value chain actors, such as policymakers and gear manufacturers.

A short description of the outcomes obtained from the different interviews conducted are presented below.

- a) During a research campaign on a **Basque trawling fishing vessel**, three members of the crew were interviewed, including the skipper, chief engineer and a boatswain (September 2024) (Figure 4).

Their main challenges and **concerns mostly relate to socio-economic aspects**. Some of these challenges are:

- Limited time on land between fishing campaigns to be shared with their relatives and friends.
 - Lack of generational renewal. Despite being a vocation-driven profession, the fishing sector is attracting fewer local entrants due to its demanding working conditions. As a result, many positions are increasingly being filled by migrant workers, who often have fewer alternative employment opportunities.
 - Shifts in fish consumption patterns are expected to shape the future of fisheries. As consumers increasingly focus on a limited number of species and specific fish products, demand for other species may decline, potentially threatening the economic viability of certain fisheries
 - Not very good press of the specific trawling fisheries due to its environmental impacts.
 - High operational costs due to increasing fuel prices
- 



Figure 4. SEARCULAR interview with the skipper of F/V, carried out onboard by AZTI member of the consortia.

Within the challenges and concerns listed, the environmental sustainability was only collaterally mentioned as in relation to the trawling press. When asked about what their understanding of the “sustainability” concept, they did not have a clear definition but they refer to the use of selective gears, respecting quotas, impacts on the seabed and/or reduce fuel consumption to reduce pollution. **Neither fisheries litter nor circular fishing gears were considered** in their interpretation of sustainable fisheries, which is an important outcome of these interviews, as it helps to understand where circularity stands within crew members. Although the three people interviewed will not be the ones deciding on the fishing gears to be used onboard, they will be the ones operating with them and needing to adapt; therefore, it is also important that they receive information on this topic so they better accept future changes.

Considering that trawling fishing gear is not lost easily, and that the different components are replaced slowly as needed, the main reasons to change to circular fishing gears would be that legislation dictates to do so, that new alternatives were to perform better than current fishing gears, and that they were cheaper.

- b) During the workshop “**Good practices for the tropical FAD tuna industry**” (December 2024) three participants were interviewed (one skipper, one shipowner and one operations manager).

The main challenges identified by respondents were **profitability, maintaining adequate catch levels, and controlling operational costs**. **Minimizing environmental impacts** was also mentioned.

When discussing the concept of “sustainability”, participants primarily associated it with ensuring the long-term viability of fish stocks and safeguarding opportunities for future generations of fishers. Their responses suggest that sustainability is largely perceived as maintaining or increasing fishing activity while simultaneously reducing its environmental footprint.

Interviewees acknowledged that the fishing method they currently use—purse seine fishing supported by Fish Aggregating Devices (FADs)—is only partially sustainable. On the positive side, they emphasized that the fishery is subject to extensive regulation and that industry actors generally demonstrate a strong sense of responsibility. However, they also recognized several environmental challenges, including the potential loss of fishing gear, the resulting impacts of marine debris, and high fuel consumption.

Overall, participants expressed satisfaction with their current fishing gear. When asked which characteristics could motivate them to adopt an alternative solution, they identified the following priorities: (1) improved social acceptance, (2) longer service life, (3) enhanced fishing performance, and (4) easier end-of-life management. Notably, attributes more directly related to environmental sustainability—such as improved recyclability or reduced interactions with non-target species—were not mentioned among the key decision-making factors.

- c) During the **Nor-Fishing conference** (Trondheim, August 20–22, 2024), a total of 12 participants from the **manufacturing sector** were interviewed. While the majority were based in Norway, additional perspectives were gathered from participants in England, Ireland, and South Korea (Figure 5).

When asked about their understanding of sustainability, 67% of respondents associated it with fishing gears and products manufactured from circular materials, characterized by a low CO₂ footprint and minimal environmental pollution.

Regarding the key factors influencing a potential transition from conventional to more sustainable gear, regulatory compliance emerged as the most frequently cited driver (Figure 6). This was followed by the ease of recycling components and improvements in energy efficiency.

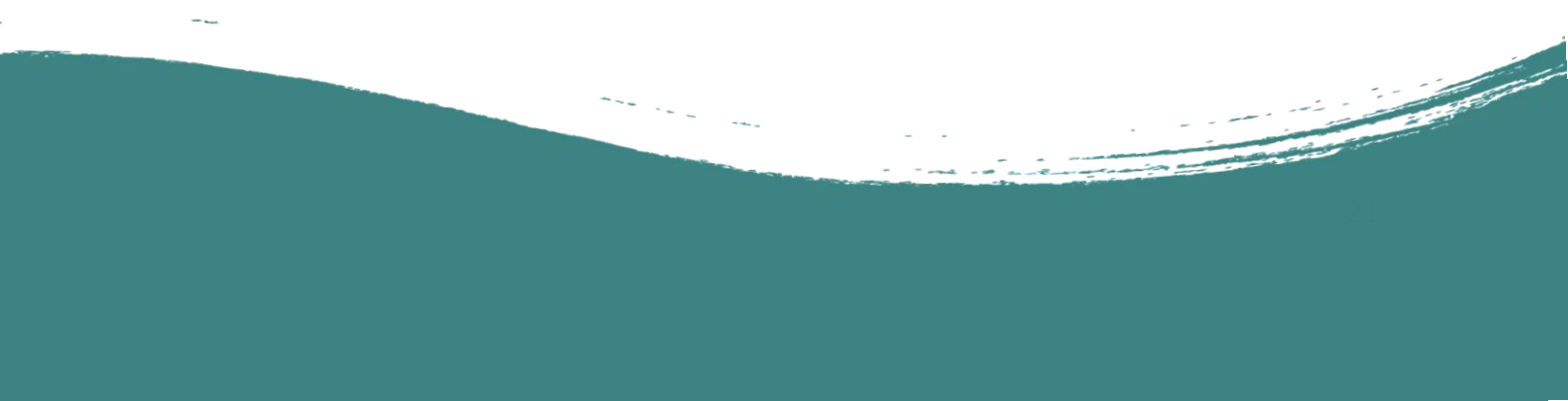




Figure 5. Photo taken at the Nor-Fishing conference during the presentation of SEARCULAR, at a moment where WP2 leads interacts with the audience.

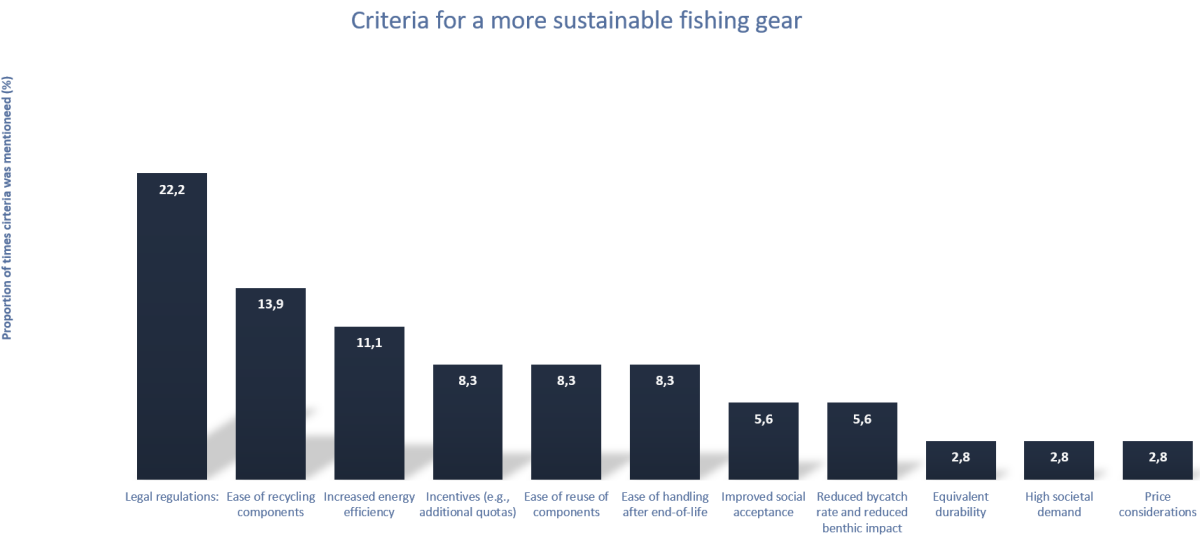


Figure 6. Key factors influencing a potential transition from conventional to more sustainable gear.

- d) The interview with officers from the [Spanish Ministry for Ecological Transition](#) focused on the implementation of the Single-Use Plastics Directive (SUP), particularly the provisions related to fishing gear and the establishment of an Extended Producer Responsibility (EPR) system.

They stressed that at present, there is significant **fragmentation in the management of EOL fishing gear** across Spain. Different regions and ports follow very different approaches, including:

- Disposal of fishing gear together with other waste streams.
- Collection and recycling systems operated by private companies.
- Recycling initiatives led by companies.
- Partnerships with organizations that integrate recycled material into their production operations.
- Port-specific waste management schemes implemented by port authorities.

Key challenges identified were:

- Lack of reliable and harmonized data on the quantities of fishing gear placed on the market and subsequently collected.
- Low participation rates from both producers and ports in existing surveys.
- Absence of consistent approaches across regions and ports.
- Technical difficulties associated with recycling fishing gear made of multiple materials and often contaminated with organic matter.
- Extensive reuse of gear components, which complicates traceability and life-cycle monitoring.
- The existence of second-hand markets without formal reuse management systems.
- Challenges related to the transboundary management of waste generated by fleets operating outside Spain.

As a future outlook, it was highlighted the future introduction of eco-modulation mechanisms, under which producers using more sustainable materials or incorporating eco-design principles may benefit from reduced financial contributions to collective EPR schemes. Certification of materials and the development of more circular product standards are expected to play an important role in the future.

- e) In an interview with the CEO of a Basque [gear manufacturing company](#), representing a company focused on the development and manufacture of trawl fishing gear, the interviewee shared her views on sustainability, industry challenges, and the potential implications of Extended Producer Responsibility (EPR) legislation.



She defines **sustainable fisheries** as fishing activities that maintain a balance with the environment and do not cause ecological damage. Sustainable fishing gear, in her view, should minimize impacts on fish populations, the seabed, and the marine environment.

She rated the sustainability level of the fishing gear that her company develops at 6–7 out of 10. While the gear is primarily made from plastic materials, some designs incorporate escape mechanisms for small-sized species, improving gear selectivity. She emphasized that the sustainability of fishing gear depends not only on its design but also on how it is used.

Sustainability is an important concern for the company. Current efforts include exploring biodegradable materials, improving recycling practices, and seeking alternatives to conventional plastics, although these solutions are expected to increase costs. EOL management remains challenging, although some components such as nylon nets, metals, and floats can be recycled or reused. For example, parts of discarded nets are reused in mussel farming.

She is not aware of alternative fishing gears that are clearly more sustainable than those currently being produced by her company. When asked which aspects should be improved, she highlighted:

- Lower environmental impact.
- Greater energy efficiency.
- Overall improvement in sustainability performance.

The interviewee identified three key challenges facing their company:

- **The reduction of the fishing fleet**, although the company continues to attract new customers.
- The **negative public perception of trawling**, which is increasingly portrayed negatively in the media, leading some people to believe the activity is harmful or even illegal.
- **The difficulty of transitioning towards more sustainable materials**, particularly the limited availability of biodegradable alternatives from suppliers.

To address these challenges, the company focuses on adapting to regulatory requirements and remaining flexible in response to future legislative developments. They have not yet assessed the full impact of the future EPR legislation because important elements of the regulation are still unknown. She believes that one of the main challenges in Spain will be coordinating producers, determining which companies will be included in the system, and creating an organization capable of managing compliance, collection, recycling, and collaboration with ports and waste-management operators. This will affect customers through higher product prices and to the company itself

with additional administrative and operational requirements related to waste separation and disposal.

Beyond EPR compliance, she considers that producers can contribute to sustainability by:

- Developing biodegradable fishing gear materials
- Designing more selective fishing gear
- Improving energy efficiency through gear design
- Promoting fishing practices that reduce environmental impacts

1.2 Co-creation of solutions with stakeholders

To facilitate the co-creation processes a training session was organized addressing the leaders of the different SEARCULAR solutions on the incremental development of products (Subsection 1.2.1.). After the training, the solutions leads had the opportunity to reflect on how to carry out the iterative process with the different stakeholders (e.g., frequency of contacts, contact means, need for workshop organization, etc.). The iterative process for the co-creation of the different solutions is detailed in Subsection 1.2.2.

1.2.1 Training on incremental development products

The underlying objective of having a Stakeholders Taskforce was to support the co-development of solutions through their feedback and expert input which would lead to more acceptable, fit-for purpose solutions. Given the uneven previous experience of partners working with stakeholders across work packages (WPs), an overview of the iterative approach to be implemented was given to the project partners during the kick-off meeting in October 2023.

The **iterative approach in product development** is a methodology that involves repeating cycles of development and refinement to continuously improve a product (Figure 7). Among its advantages over more traditional product development methods, the iterative approach enables flexible and adaptive development, allowing teams to respond quickly to feedback and changing conditions. It supports early testing through rapid prototyping, reduces risks and costs by identifying issues early, and ensures continuous improvement and higher quality outcomes.

Additionally, it strengthens stakeholder engagement, collaboration, and alignment with user needs, ultimately leading to faster time-to-market and better responsiveness to evolving contexts.



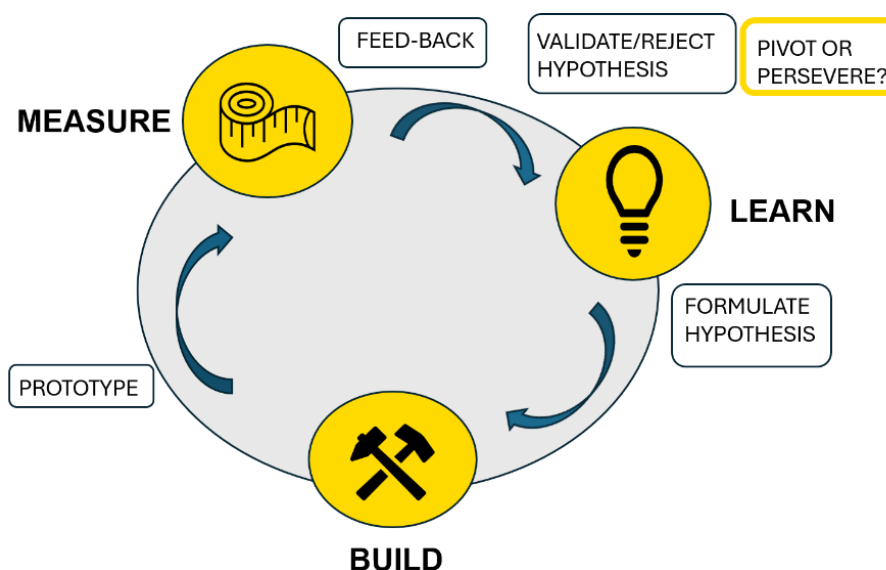


Figure 7. Conceptual model for the iterative product development proposed in SEARCULAR.

The principles of this approach were explained to the Consortium members attending the kick-off meeting so that all solutions were developed iteratively and in a cooperative way.

1.2.2 Iterative process for solution development

At the beginning of the project, it was decided that WP5 leads would support solution leads with the iterative process, but solution leads would be the main contacts for stakeholders to secure already existing trust. Yet, to have traceability of the iterative co-creation process for the development of the different solutions, a short template was produced to record the most important iterations with the stakeholders (Figure 8). For the development of each solution, the solution leads defined their own iterative process, identifying the frequency of meetings depending on stakeholders, the need for in-person meetings, need for organizing workshops, etc. The description of these activities are included in the following subsections.

TEMPLATE TO REGISTER INTERACTIONS WITH STAKEHOLDERS

DATE	
WORKPACKAGE	
NAME PERSON COMPLETING	
SUBJECT	
I HAD THE CONVERSATION BY... (TELEPHONE, EMAIL, ONLINE MEETING, IN PERSON MEETING, ETC)	
I SPOKE WITH... (NAME AND AFFILIATION OF THE PERSON)	
OBJECTIVE OF THE CONVERSATION	
DESCRIBE YOUR CONVERSATION IN 2-3 LINES	
DECISIONS TAKEN OR KEY CONCLUSION OF THE CONVERSATION	

Figure 8. Screenshot of the template used to record the iterative process within each of the solutions developed.

Solution #1 development: Recycled polyamide-based dolly ropes

The first phase of solution development focused on generating and selecting the most suitable compound candidates for recycled pellets at laboratory scale by GAIKER. The description provided concentrated on the activities of extrusion, assembly, and selected sea trials led by AZTI.

Discussions on dolly rope configuration, testing, and abrasion resistance were conducted with the Director of Research and Development in Fisheries at the **Norway Seafood Research Fund** (FHF). These exchanges informed key design decisions, including adopting a thick monofilament structure instead of bundles of 0.5 mm filaments twisted into ropes. They also helped define the sea-based testing approach and provided valuable insight into the abrasion testing methodologies used at SINTEF.

In the search for a company capable of extruding recycled polyamide pellets, several suppliers were contacted, including **S-EnPol Co., Ltd.**, a South Korean eco-friendly polymer provider, and **Catchgreen**, a South African company specializing in biodegradable fishing gear for global markets. However, as both companies focus exclusively on biopolymers, the collaborations did not materialize.

For the setting up of the chaffing matt with the dolly ropes, a local fishing net manufacturing company based in the Basque Country, **Nabera**, was contacted. A net mender working for a Basque shipowner owning several trawlers (including F/V **Eguzkilo**) helped to prepare the chaffing mat and advised on how to do it, attached it to the cod-end for the tests at sea (Figure 9).



Figure 9. Trawling net arrangement to test the circular dolly ropes (black) against the conventional material (orange).

For the sea trials, several vessels were contacted. An initial attempt to establish connections through **Eurored**, an association of net manufacturers, did not result in a viable collaboration. Then R/V Ortze, operated by the Blas de Lezo Nautical School in Pasaia (Spain) was approached, but limitations in staffing and vessel capabilities made it unsuitable for conducting the tests. Subsequently, the F/V Ensenada de Bueu, another trawler within AZTI's network, was reached. Although tests were ultimately not carried out with this vessel due to the absence of dolly rope usage, the information provided—such as coded dimensions and mesh sizes—proved valuable for planning onboard trials.

Additional contacts were explored through **OPROMAR**, a Galicia-based association of fish producers. Through this network, the F/V Hermanos Soage agreed to carry out dolly rope trials from June 2026 onwards (Figure 10). In parallel, another AZTI contact, the F/V Eguzkilo, a trawler operating in the Bay of Biscay, also agreed to conduct tests, which were scheduled for May 2026 (Figure 10). Tests have now finalized and conclusions are being drawn.



Figure 10. Images of supporting vessels F/V Eguzkilore (left) and Hermanos Soage (right) that agreed to collaborate with the testing of Solution #1.

Solution #2 development: Marine biodegradable demersal seine ropes

In SEARCULAR, SINTEF developed and tested the biodegradable demersal seine ropes. This process required the involvement of the following main three stakeholders:

- **Selstad**, a Norwegian company specializing in the provision of expertise, design, equipment, and services for sea-based industries—particularly fisheries and aquaculture—with which SINTEF maintains a long-standing and strategic collaboration.
- **SENBIS**, a Netherlands-based technology and R&D company that developed the biodegradable polymer used in the demersal seine rope applied in this project.
- **F/V Fortuna**, a demersal commercial fishing vessel operating along the Norwegian coast, which collaborated in the project by testing the newly developed biodegradable ropes under real fishing conditions.

In total, they maintained more than 20 interactions with these stakeholders, mostly in person, but also by phone and email (Figure 11).

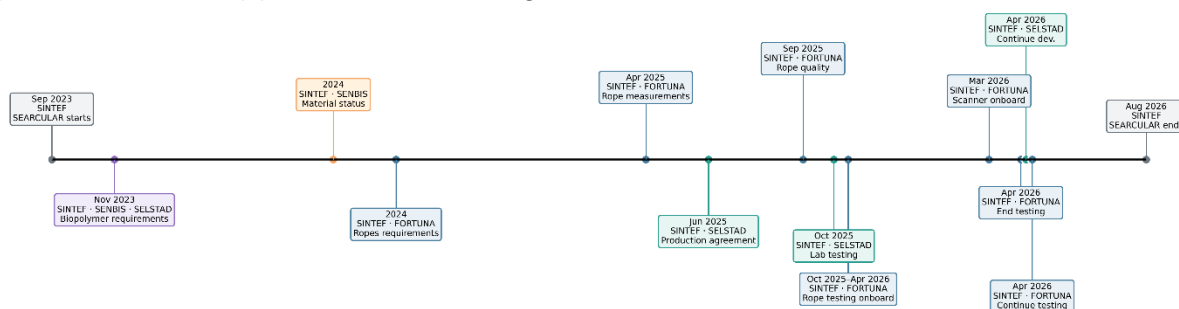


Figure 11. Key achievements resulting from the iterative processes carried out between SINTEF and SENBIS, Selstad and F/V Fortuna.

The first stakeholder interaction within Solution #2, was that between SINTEF, SENBIS and Selstad, occurring right at the beginning of the project (November 2023), at Selstad facilities. This interaction was about how to produce bio-polyester ropes – from the selection and production of pellets, all the way up to full-scale production at rope production factory. During that session, these organizations determined the bio-polymers requirements for extrusion at the Selstad rope factory. In addition, they traced a plan for the way forward in the project and they visited the rope production facilities. After this meeting, and during the next two years the focus was on the bio-polymer development, for which SINTEF and SENBIS maintained several conversations to be informed about the status of the bio-polymer development, and exchange feedback about the different filaments produced. In parallel SINTEF and the captain and crew members of F/V Fortuna maintained several interactions as in relation to how new bio-polymer new ropes should be in terms of thickness, quality, etc. to perform adequately in the fisheries, which guided the production of ropes. In addition, they defined together the standards to measure and scientifically test abrasion of commercial demersal seine ropes.

The next important milestone was the compromise agreement from Selstad to carry out the rope production (June 2025). After this agreement, and while ropes were being produced, iterative conversations were about how to perform laboratory testing of ropes and fibres at Selstad rope production facilities, resulting on the definition of a standard setting for the abrasion testing machine for testing fibres for rope production (October 2025). On this same month, Fortuna took the new ropes on board for testing, and maintained monthly conversations with SINTEF, to provide feedback on their performance and measurements. In April 2026, and after discussions with F/V Fortuna, it was brought a scanner onboard to take measurements (Figure 12).



Figure 12. Image showing ropes while being measured multiple times onboard along the sea tests in F/V FORTUNA.

By then, ropes were worn out and it was decided to bring them to land and end the testing. Based on the positive outcomes, SINTEF and Selstad agreed on continuing the development of new ropes after the end of the project, and F/V Fortuna also agreed on testing these new ropes after project ends, suggesting a high level of acceptance.

Solution #3 development: Biodegradable FADs (BIOFADs)

AZTI has a long-standing track record of collaboration with the tropical tuna fishing industry, developed through continuous engagement with both shipowners' associations and individual companies. Within the SEARCULAR project, AZTI further strengthened these relationships by maintaining close cooperation with stakeholders who had previously collaborated on earlier versions of environmentally friendly FADs developed along the years in different projects.

Building on this foundation, the development of BIOFADs in SEARCULAR followed a structured, stepwise approach:

- In the early stages of the project, a questionnaire was designed to gather detailed information on current FAD construction practices, materials used, deployment strategies, and perceived challenges and opportunities for adopting biodegradable alternatives. This step ensured that the eco-design process was grounded in real-world operational contexts and industry needs. It was sent to a diverse group of professionals involved in the use and management of FADs, with participants located primarily in Spanish coastal towns such as Bermeo, Vigo, and A Coruña, as well as international fishing hubs like Manta in Ecuador (more details in Deliverable 3.2 *Eco-designed Biodegradable dFAD including new potential biodegradable materials*).
- Between April and October 2024, several consultations were conducted with the two main **shipowners' associations** in the Basque Country (ANABAC and OPAGAC). During these meetings, the SEARCULAR project was presented and their participation was actively sought. Initially, their involvement was envisaged primarily for conducting sea trials using their vessels; however, the collaboration later evolved towards potential participation in the co-development of solutions.
- Both associations declined to participate at that point, expressing significant concerns regarding the proposed BIOFAD model—specifically the “JellyFAD” developed by ISSF (a SEARCULAR subcontractor and a regular partner of AZTI in related initiatives). Additionally, as these associations were already engaged in the development and testing of alternative BIOFAD designs in the Atlantic Ocean, they indicated that they would only consider participation if testing activities were conducted in a different ocean basin.

- Eventually, one of the OPAGAC companies (**Echebastar**) agreed to participate in the design and testing of BIOFADs in the Indian Ocean. A series of workshops were conducted to co-create the design of several prototypes to be tested both in a controlled environment (Mediterranean sea) and in real conditions (fishing grounds in the Indian Ocean)
- The **first workshop** took place on December 9th 2024. Eleven participants attended, including scientists from AZTI and ISSF, as well as personnel from the purse seiner company Echebastar. The project objectives and the specific goals of WP3 were presented and a retrospective analysis of lessons learned was conducted, focusing on previous experiences to assess existing BIOFAD alternatives and biodegradable materials for the different FAD components, as well as the configuration of these elements during BIOFAD construction. This exercise enabled the identification of components that still require biodegradable alternatives to replace conventional plastic or non-biodegradable materials (e.g., floats, ballast, metallic structures) (Figure 13). Results from previous studies using the JellyFAD model were also presented, along with key design parameters such as buoyancy, drag coefficient, material stress, and tension, all of which are considered in the design and construction process.

Work was carried out on three BIOFAD models to be tested during the project: two models already used by the company but fully constructed with biodegradable materials, and a third novel circular JellyFAD model (Figure 14).

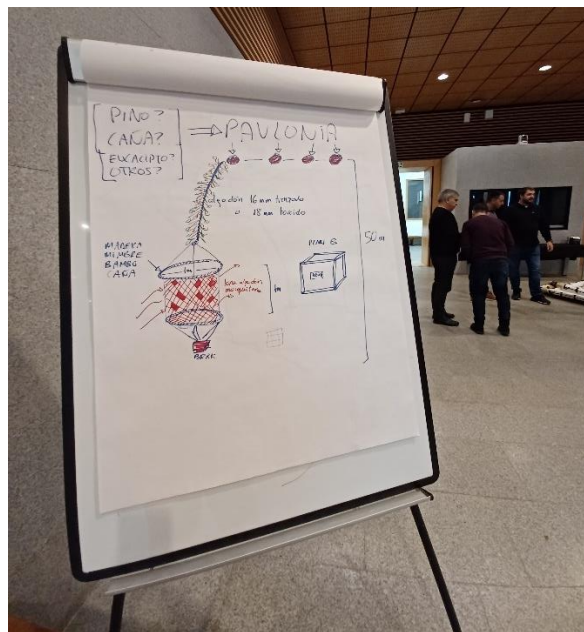


Figure 13. Co-creation of a prototype of one of the BIOFAD new models.

Key aspects such as performance, cost, manoeuvrability, biodegradability, durability, and overall impact of Model 3 were evaluated.



Figure 14. Discussions with the Echebastar staff during the workshop.

Finally, a work plan for 2025 was established, aiming to test these new models under semi-controlled conditions, as a preparatory step toward the next phase involving construction, deployment, and evaluation of BIOFADs under real conditions in the Indian Ocean.

- Shortly afterwards, in February 2025, the **Albacora** company also showed interest in collaborating with SEARCULAR. A **second workshop** was held, attended by nine participants, including scientists from AZTI and the International Seafood Sustainability Foundation (ISSF), as well as representatives from the two participating freezer purse seine tuna companies, Echebastar and Albacora, both operating in the Indian Ocean.

Discussions focused on comparing various flotation materials, including paulownia wood, balsa wood, and bio-based floats, evaluating their functional properties and suitability for FAD construction. Additionally, a detailed review of the three BIOFAD models selected for testing during the project.

- A **third workshop** was held in March 2025 in Galicia, with the same attendants as in Workshop 2. The main objective was to visit a specialized FAD construction company and to transition from conceptual design to the physical construction of the first prototypes for the three selected BIOFAD models. The session marked a critical step in the eco-design process, enabling the practical validation of design concepts and material choices.

The workshop focused primarily on the construction of Model 3, the most experimental of the three designs. Participants worked collaboratively to address technical challenges related to the cylindrical shape of the FAD, including:

- Identifying suitable materials and techniques to achieve the desired cylindrical form.
- Developing effective methods for connecting the cylindrical raft to the main tail structure.
- Adjusting flotation components to ensure proper buoyancy and stability.
- Calculating and integrating the appropriate ballast weight to maintain vertical positioning in the water column.

The outcomes of this workshop directly supported the next phases of prototype testing under semi-controlled conditions and eventual deployment in the Indian Ocean.

- The **fourth co-creation workshop** took place over two days, October 14 and 15, 2025, in Galicia. As with previous sessions, the workshop brought together scientists from AZTI and ISSF, along with representatives from the tuna purse seine companies.

The workshop served as a critical checkpoint to validate the construction process and to refine the designs based on feedback and modifications agreed upon with the fishing companies. It marked the final step in the co-creation process, ensuring that the BIOFAD designs were fully aligned with both ecological objectives and the practical requirements of the fishing industry.

Solution #4 development: Smart port-based solutions for EOL fishing gears

GAIKER initiated and developed a series of meetings and interactions with key stakeholders across the entire value chain to support the design of a smart, port-based system for the management of EOL fishing gear, including the integration of a Blue Point facility within the port environment.

- Meetings were held with representatives from the **Sötenäs Marine Recycling Center (SMRC, Sweden)**—a collaborative initiative between the Sötenäs municipality and local fishers dedicated to the collection, sorting, and processing of discarded fishing gear and marine litter—as well as with **Waterhaul**, a UK-based enterprise focused on addressing ghost gear and developing comprehensive EOL recycling solutions for fishing gear, ropes, and marine plastics.

Initial engagement provided valuable insights into their activities, business models, and strategic approaches. A follow-up visit was planned with the aim of gaining a deeper understanding of their operational systems, identifying potential

synergies, and drawing inspiration for the development of an EOL management model in SEARCULAR. However, despite several attempts to coordinate the visit, engagement remained limited and the visit could not ultimately be carried out.

A collaboration exchange was initiated in 2026 with **Refinverse Group, Inc.**, a Japanese corporation specialising in circular economy solutions, waste management, and sustainable manufacturing. Through several interactions, Refinverse expressed particular interest in the broader range of materials addressed within the project, which extends beyond their current operational focus.

These exchanges opened opportunities for future collaboration, particularly to scale recycling solutions and integrate diverse waste streams into circular economy frameworks for fishing gear management. They also highlighted strong mutual interest and clear complementarities between the organisations, laying the groundwork for further cooperation.

- Meetings were conducted with representatives from several Basque Country ports (Spain), namely Bilbao, Bermeo, and Pasaia. The main objective was to gain a comprehensive understanding of port logistics and the operational management of waste streams, with particular focus on EOL fishing gear.

These discussions provided insights into existing collection, sorting, and management procedures, key stakeholders involved, and annual quantities handled. Additionally, the suitability of the ports for the potential implementation of the Blue Point concept, as part of the port-based solution, was assessed, including a review of the proposed 3D design and its integration within the port-based management system.

The **Bilbao Port Authority** reaffirmed its strong interest in and support for the project. The information provided during this and previous meetings has been highly valuable for understanding the operational and logistical aspects of EOL fishing gear management. Based on the port's characteristics, infrastructure, and engagement, the Port of Bilbao was identified as a highly suitable location for the potential implementation of the Blue Point concept (Figure 15). The authority also provided relevant technical and operational information that has significantly supported the project's research activities and the development of the port-based circular management model.

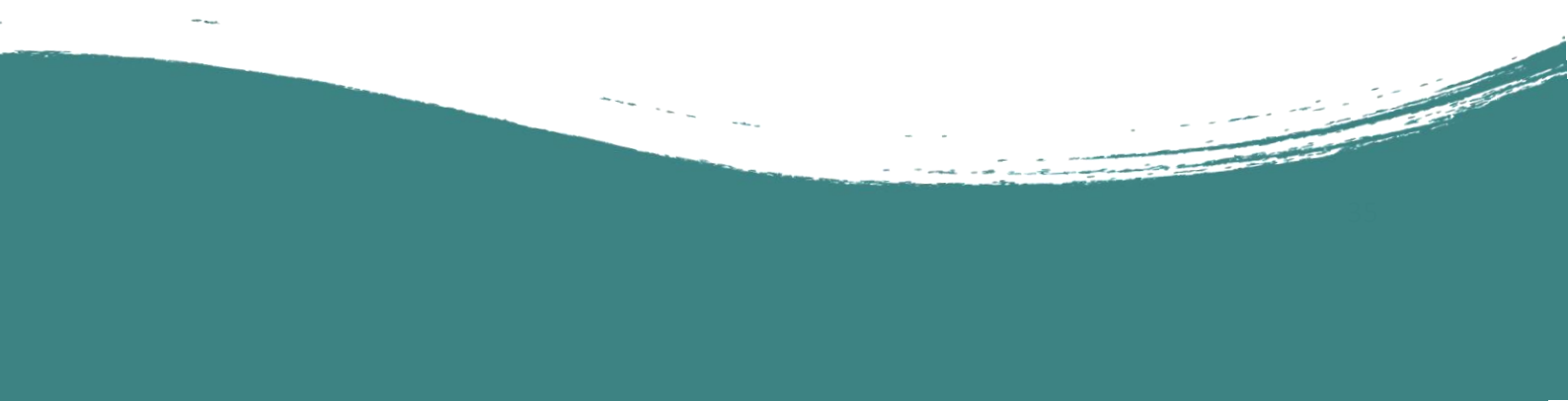




Figure 15. Images of the waste collection area of BILBAO port.

The **Port of Bermeo** demonstrated a well-organised system for the collection and management of fishing gear waste, supported by dedicated collection and sorting areas. Due to the availability of space and the possibility of expanding existing facilities, the port was initially identified as a strong candidate for the implementation of the Blue Point concept. The port management showed considerable interest in the project and expressed willingness to follow its progress and support future developments.

Regarding the **Port of Pasaia**, the information gathered significantly improved the understanding of waste flows and operational scales within the Port. This input was particularly valuable for refining the assumptions used in the design and operational modelling of the Smart Blue Point 3D system, allowing for more accurate estimation of material flows and system requirements.

- Meetings were held with several waste management companies operating in the Basque Country, including **Bidezain, Serbitzu, Tradebe and Arregi**, all of which are actively involved in the collection and treatment of EOL fishing gear. These engagements provided a detailed overview of current management practices for EOL fishing gear and related waste streams, while also enabling the exchange of knowledge on sustainable waste management solutions and the exploration of potential collaboration opportunities within the project.

Discussions focused on the full waste management chain, including the collection, transportation, sorting, treatment, and final destination of EOL fishing gear generated in Basque fishing ports. The meetings also facilitated valuable technical exchanges on key aspects such as operational challenges, material characterisation, recycling potential, and the development of circular economy approaches for fishing gear waste.

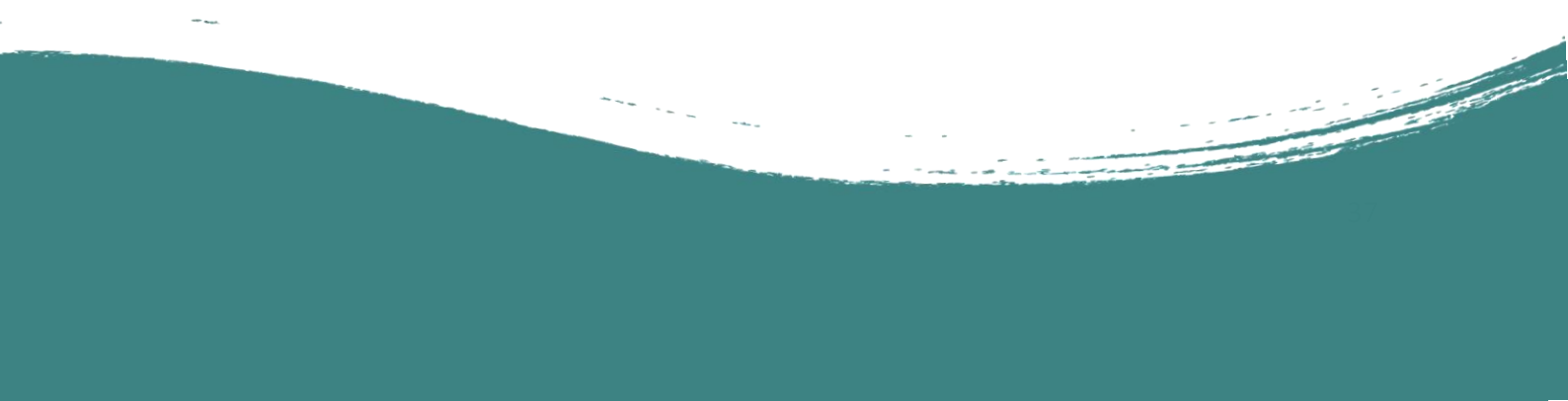
The collaboration with these companies proved highly valuable. Through their support, approximately 14 tonnes of EOL fishing gear materials were made available for research and validation activities. As these materials were sourced from multiple fishing ports across the Basque Country, they provided a representative sample of regional fishing practices, gear types, waste streams, and material compositions. This input significantly contributed to material characterisation efforts, the development of the Blue Point concept, and the assessment of sustainable management and recycling pathways for EOL fishing gear.

- Close interaction was maintained with representatives of the **Basque Government** to ensure continuous coordination throughout the project. This engagement aimed to align project activities with regional waste management strategies and to gather key information on the regulatory framework, waste management system, and stakeholders involved in the treatment of EOL fishing gear.

Their support has been instrumental in improving the understanding of the structure and roles of the different waste management operators in the region, as well as in facilitating access to EOL fishing gear materials supplied by waste managers for research purposes. Furthermore, this institutional collaboration has strengthened coordination with relevant stakeholders across the Basque Country. It is expected to remain a key actor in the future deployment and scaling of the proposed solution.

Additional engagement with the Basque Administration included collaboration with the **Gipuzkoa Provincial Council** to investigate beach waste management systems. This covered collection schemes, infrastructure, and operational procedures for both routine litter management and storm-induced coastal waste accumulation.

The Provincial Council provided relevant reports and technical documentation describing current practices, including container-based collection systems and specific procedures for managing waste deposited along the coastline following adverse weather events. This information proved directly applicable to the development and refinement of the project's 3D design model, enabling the integration of coastal waste management functionalities into the proposed system.



In particular, these insights supported the conceptualisation of a facility capable of handling both routinely collected beach waste and debris transported to the coast during extreme meteorological events.

- Outside the Basque Country, contacts were also established with representatives of the **Port of Vigo (Spain)** and **Chicolino**, a Galicia-based company specialising in the collection, recovery, and recycling of fishing nets into high-quality, innovative products. A joint meeting was held to better understand their respective roles within EOL fishing gear management chain.

During the meeting, the Port of Vigo presented its facilities for the reception, collection, and classification of end-of-life materials, while Chicolino outlined its activities in the recycling and valorisation of selected fishing nets. The discussion further addressed operational practices, as well as current challenges and limitations within the recycling chain. This exchange provided valuable insights into the integrated management approach between port infrastructure and recycling operators in Galicia. It also highlighted key operational constraints associated with fishing gear waste treatment. Overall, the interaction contributed significantly to strengthening the project's knowledge base and identifying potential synergies with existing regional recycling schemes.

2. Social acceptance of solutions

Two dedicated workshops were organized at the end of the project with the aim of sharing the solutions developed within the context of SEARCULAR, discuss the status and challenges in the development of circular fishing gears, and received feedback on outcomes of SEARCULAR. These two workshops and the outputs are discussed below.

2.1 MARLICE workshop

Since its launch in 2019, MARLICE (International Forum on Marine Litter and Circular Economy) has become a leading international forum for researchers, industry representatives, policymakers, and other stakeholders working to share knowledge and advance practical solutions to marine litter.

SEARCULAR organised a dedicated session (<https://marlice.org/en/programs/reducing-marine-litter-from-fisheries-through-the-design-of-circular-fishing-gears/>) at the MARLICE 2026 Forum, held on 20 May in Tenerife, Spain, to foster debate and dialogue on circular solutions to reduce marine litter. The session, entitled "Reducing marine litter from fisheries through the design of circular fishing gear: Case studies from SEARCULAR", was



moderated by Oihane C. Basurko, SEARCULAR coordinator (Figure 16).

The session brought together participants with diverse expertise and backgrounds, including scientists, NGOs, gear manufacturers, policymakers from the Spanish Government and regional bodies, representatives of organisations such as HELCOM and OSPAR, and actors from the plastics industry. It included contributions from the following speakers:

- Oihane C. Basurko | AZTI (Moderator)
- Anja Alvestad (SEARCULAR WP2 leader) | SINTEF
- Stephan Kabasci (SEARCULAR T5.4 leader) | Fraunhofer UMSICHT
- Iker Zudaire (SEARCULAR WP3 leader) | AZTI
- Nekane Naberan (CEO) | NABERAN GROUP



Figure 16. An image during the session allocated to present SEARCULAR.

This session provided an opportunity to present progress from the project to an expert and engaged audience, while contributing to broader discussions on circularity in the fisheries sector. SEARCULAR's participation was highly valuable, as it contributed to the dialogue on how circular economy practices can be applied in fisheries to reduce marine litter and microplastic pollution. The session also complemented other forum presentations and discussions focused on the valorisation of EOL fishing gear and marine litter.

2.2 SEARCULAR workshop: Promoting circular fishing gears

SEARCULAR organized an additional workshop on June 10th 2026, back to back with the Final Meeting of the SEARCULAR Consortium, to present the project solutions to the wide community of stakeholders of SEARCULAR community and to have their feed-back.

The workshop was a hybrid event, with some participants online and the rest attending from the Aquarium of San Sebastián (Spain). The workshop was organized into four main sections: Keynote speakers, overview of SEARCULAR main outputs, presentations from external experts on fishing gear status at different levels (e.g., policy, sustainability certifications, etc.), and a moderated discussion between the audience and experts.

The workshop was opened by two keynote talks:

- Stephan Kabasci, Research Manager at Fraunhofer UMSICHT gave a presentation on “Standardising circular fishing gear: where we are and how we got here” (Figure 17).
- Roger Larsen, Professor at Arctic University of Norway who talked about “Experiences on the use of alternative materials for Fishing gear”.

Then, some key WPs and tasks leaders offered an overview of the main findings and progress of the four solutions, offering some discussion material for the subsequent debate.

- Oihane C. Basurko (AZTI) presented the recycled polyamide dolly ropes (solution #1)
 - Anja Alvestad (SINTEF Ocean) talked about the bioseine ropes (solution #2)
 - Iker Zudaire (AZTI) gave a perspective view on the progress of BIOFADs (solution #3)
 - Paule España (GAIKER) talked about port-based solutions for EOL fishing gear (solution #4)
 - Katri Behm (VTT) showed some results of the Life Cycle Analysis (LCA) applied to solution #3 and some tradeoffs to consider)
 - Helene Gomes (AZTI) talked about the Cost Benefit Analysis (CBA) applied to solution #4
 - Alberto Katsumiti (GAIKER) presented the Degradation/Biodegradation and toxicity analysis of solution #3.
- 

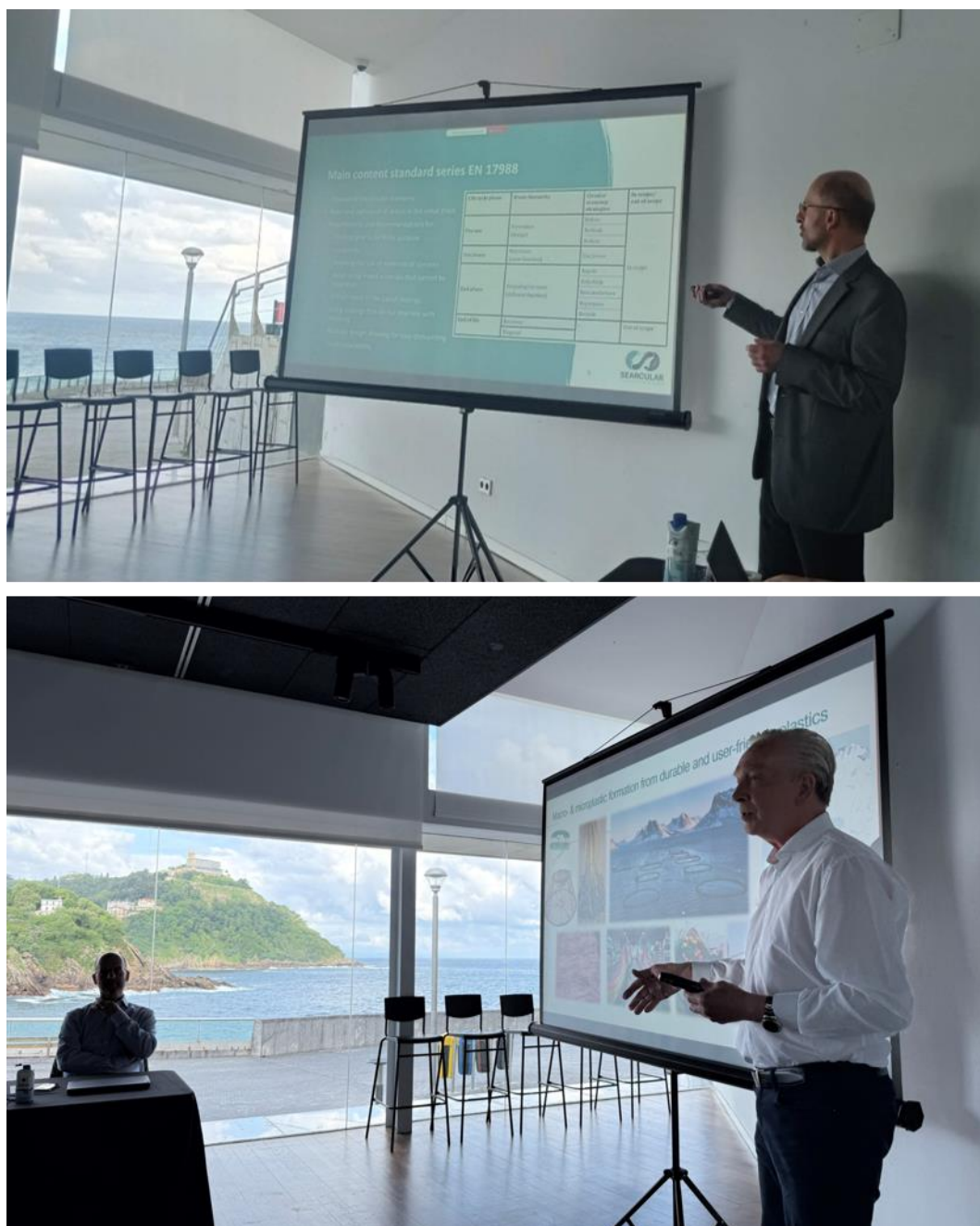


Figure 17. Keynote presentation from Stephan Kabasci (top) and Roger Larsen (bottom).

A panel of experts was then introduced and each of them talked briefly about subjects relevant for the workshop topic:

- Hernan Calvo (Head of Corporate Development Europe and Latin America, **Plastic Energy**) talked about recycling.
- Manuel Sistiaga (Research Manager, **SINTEF Ocean**) talked about research.

- Ane Iriondo (Sustainability Responsible, **Echebastar**) talked about the fishing industry (tuna company testing BIOFADs).
- Kelsey Richardson (Environmental Consultant, **FAO Fisheries Division**) talked about policy.
- Isadora Moniz (Senior Fisheries Manager for Spain & Portugal, **MSC**) talked about certification.

Following the presentations, a roundtable discussion moderated by SEARCULAR Coordinator Oihane C. Basurko was held (Figure 18).

To initiate the round table a question was raised to key experts about **what is needed for the uptake of circular fishing gears** in few words. Their responses highlighted several key requirements, including raising awareness, ensuring the cost-effectiveness of circular fishing gears, involving stakeholders throughout the development process, and increasing understanding of the negative environmental and societal impacts of failing to engage in the transition towards circularity.



Figure 18. Round table with external experts in the SEARCULAR final workshop.

Then an open discussion in which participants raised questions to external experts was organized. During this discussion several challenges and opportunities related to the transition towards circular fishing gears were raised. Participants noted that existing **certification schemes** currently focus on material management practices rather than the biodegradability of materials themselves.

Some **regulatory requirements** regarding biodegradable materials are already emerging in some fisheries, and are expected to expand in the near future. There was broad agreement that **international standards and policy frameworks** will be needed to support the reduction of marine litter and facilitate a globally consistent transition.

Several economic considerations emerged as a major concern and their were discussed with the panel of experts. On the one hand, adoption of innovative circular solutions is often perceived as a risk due to the lack of immediate benefits or guarantees of return on investment. There is also a high level of **uncertainty** regarding the future **availability and cost** of biobased materials, while the. Experts also emphasized that the success of circular fishing gears will depend on **consumers' willingness to support** and potentially pay for more sustainable products. However, although sometimes consumers accept certain prices, as recently observed, product prices do not necessarily translate into greater returns for fishers, limiting their capacity to invest in improved materials and practices.

Finally, stakeholder engagement was repeatedly identified during the question round as a critical factor for success. Experts highlighted **awareness-raising** among consumers and other actors in the value chain as essential to enable informed decision-making and generate demand for circular products. They also stressed the importance of **involving stakeholders throughout the transition process**, creating incentives for participation, and fostering collaboration among industry, public administrations, and other relevant actors. Finally, the **diversification of supply chains and material providers** was identified as a potential way to enhance resilience and support the broader uptake of circular solutions in the fisheries sector.

To close the session, a common question was posed to all the experts: **What is needed to continue progressing in the field of circular fishing gears?** To this question, expert indicated the following key priorities i) strong cooperation between researchers, fishers, industry, certification bodies, policymakers, recycling actors, ii) broad implementation of certification schemes across different sectors, iii) political will, iv) sharing and communicating results with key stakeholders, v) securing funding that allows continuation, and vi) education. As **key conclusion** of the workshop, participants agreed that the **transition towards circular fishing gear is technically feasible and supported by promising research and pilot-scale demonstrations**, as it has been proved with SEARCULAR.





Figure 19. In person participants in SEARCULAR final workshop (top) and panel of experts and moderator (bottom).

3. Challenges and benefits from stakeholder engagement

The development of circular fishing gear, and in general, innovation projects require from stakeholder engagement. Furthermore, this requirement often becomes compulsory, as funding calls often request for such involvement. However, stakeholder capacity to engage is limited. In that context, in this deliverable, we have aimed to identify both the challenges and benefits of stakeholder engagement in SEARCULAR, exploring this from a Solution perspective, and in different ocean-related EU funded projects, for which a questionnaire survey was designed and distributed, among leaders.

3.1 SEARCULAR perspective

To gather information from SEARCULAR solutions' task leader a questionnaire was designed and distributed at two different points of the project (intermediate and end points) (Annex III). The questionnaire contained 17 questions and was structured into two sections. Section 1 aimed to characterise the type of engagement carried out within the Solution, and Section 2 aimed to identify the main barriers, solutions, and benefits.

The number of **stakeholders engaged varied across Solution development, and ranged between 10 and 20 stakeholders per solution**. In the case of the BIOFAD development (Solution #3), the stakeholder engagement primarily, but not limited to, focused on the tuna fisheries part of the value chain, with two key companies being involved, as well as main producer organizations, and the entire Indian Ocean tuna fleet. For the development of recycled dolly ropes (Solution #1), it was required the engagement with 20 stakeholders, covering different sectors of the value chain (i.e. fishing sector, recyclers, manufacturers, researchers, etc.).

It is important to highlight that while for Solutions #2 and #3, there was an existing relationship with the key stakeholders, Solutions #1 and #4 were at very initial stages of these relationships. In general, they agreed on **benefits of having pre-existing relationships, although** they also identified the **benefits of fresh inputs steaming from new relationships**. Thus, it required high efforts to establish the contacts. Nevertheless, although the relationships were nearly started within the context of the project, these stakeholders welcomed the initiatives and were committed with the project. In contrast, in Solution #3, for which long-established relationships exist, it was more difficult for them to adopt the approach proposed for this project, and it required re-visiting.



Engaging with stakeholders implies high commitment, with one solution requiring weekly meetings, other monthly meetings and the other two with more spaced meetings. In general, each solution adapted the periodicity of meetings to their needs. While one Solution required increasing the periodicity of meetings towards the end of the project, in other Solution, it occurs the opposite, relaxing the frequency of meetings towards the end. It is suggested the **monthly meetings allows securing a fluent dynamic**.

Engaging stakeholders throughout the project proved challenging. Securing initial commitment to participate was difficult, particularly given budget limitations that restricted the organization of in-person meetings, which are often key to building trust and momentum, although this would have also been challenging due to time limitation of stakeholders themselves and their priorities. In addition, stakeholders were not always willing to openly share experiences, with some **displaying a degree of secrecy that hindered collaboration and knowledge exchange**. A generally conservative mindset also **limited openness to innovation**, especially when it involved perceived risks. This was particularly evident in the reluctance to test new biomaterials, as stakeholders were concerned about potential disruptions to standard production processes and possible damage to machinery. In the development of one solution, participation declined over time, reflecting both competing priorities within stakeholder organizations and limited sustained engagement. Internal changes within stakeholder organizations further disrupted continuity and made fluent communication harder to maintain. In general, **trust was not always easy to generate**. Certain **stakeholders perceived the project partners as potential competitors** (and even project partners also perceived at times other partners as competitors). This perception limited openness and, at times, reduced the level of engagement and collaboration.

Despite the challenges encountered, **stakeholders made important contributions** that ultimately strengthened product development. Their active involvement helped ensure that the solutions addressed real needs. Stakeholders also supported the process by providing materials essential for product development and by contributing to material choices and the definition of designs. Their practical experience proved valuable in identifying and resolving specific technical issues, facilitating problem solving throughout the development phase. Furthermore, they played a key role in identifying suitable study site areas for testing the products, ensuring that validation took place under realistic and relevant conditions. As an example, Solution #4 changed its view regarding stakeholder engagement from the first assessment to the last assessment, having initially reported lack of interest for participation and finally, indicating satisfaction and fruitful engagement at the end of the project. Thus, **perseverance** has been crucial in this case.

Commitment was enhanced when stakeholders were actively involved in the development of solutions, as participation fostered a sense of ownership and relevance. As stakeholders recognized potential benefits, they would be more compromised.



Open and transparent communication, together with flexibility to **adapt project activities to stakeholders' specific needs, further strengthened their willingness to participate.** It was also clear that arriving with a pre-defined solution was not the way forward and highlights the **importance of co-creation processes.**

Several participants noted that **securing the commitment of a first stakeholder often encouraged others to join, creating a snowball effect** in which existing collaborations increased the credibility and visibility of the initiative. For example, in Solution #4 gaining access to certain ports facilitated access to others, while engagement with material providers and technology developers helped expand the network of collaborators. Furthermore, in Solution #3, the involvement of one of the most important tuna companies, triggered the commitment of another important tuna company. This may have been due to seeing one stakeholder already being engaged helped building trust and credibility around the project and realising that could be left behind if not engaging in this solution development from the start. This has created new opportunities for collaboration and has strengthened the overall network of partners involved in the project.

In general, although not in all solutions, the co-creation process has been enriching and brought benefits both for stakeholders and the research team. However, **stakeholders have require adapting to the scientific process** (e.g., number of samples, test, long period for validation, etc.). On the other hand, the **research teams have required high levels of flexibility and adaptation**, patience to establish trust, strong communications skills, and balancing scientific rigor with the practical needs of the companies. Even if it may have been frustrating for both at times, it is considered that the co-creation process has led to more relevant and impactful solutions.

Based on the feedback received, stakeholder engagement and collaboration could have been improved with stronger and **earlier involvement of stakeholders** throughout the project lifecycle. Including stakeholders' views from the beginning, in defining project objectives and expectations, would have helped align interests, reduce initial resistance, and enable a smoother and more efficient co-creation process. Additionally, stronger and clearer **communication** about the nature of the project as a research initiative—with no intended impact on market dynamics or competition—could have alleviated potential concerns and built trust. Fitness of solution is crucial for stakeholder engagement; at the moment they **perceived the benefits** of contributing to this process and the **alignment with policy requirements**, collaboration increased. Overall, a more **proactive, transparent, and inclusive approach** from the beginning would have strengthened collaboration and improved the effectiveness of the production process.



3.2 Perspectives from other EU funded projects

Considering the difficulties to engage with stakeholders, and in order to obtain feedback on how to improve this process and make it effective, a questionnaire survey was designed aimed at gathering experiences from other EU funded marine research and innovation projects, orientated towards the design of products (Annex IV). This survey was structured into eight sections combining closed-ended and open-ended questions.

First section aimed at characterizing the project and product of focus, including starting and ending TRL of the product. Second section aimed at identifying the type of stakeholder engagement within the project, including questions about type of stakeholders involved, phase of involvement (e.g. proposal stage, development phase), level of engagement, and effect of prior existing or non-existing relationships.

The next three sections aimed at characterizing and identifying the role of stakeholders in the different phases: proposal phase, design of the product, manufacturing and testing of the product. Within these four sections, specific questions to obtain detailed information were included (e.g., issues occurring during the testing phase).

The next section focused on the final product and its adoption, for which questions regarding the status of the final product (e.g., same or different from initially planned, need for adoptions in further developments), the potential uptake of the product in the market, as well as barriers to full adoption, were included. An additional section aimed at collecting reflections and lessons learnt, trying to identify what factors triggered more positive engagement as well as those that affected to reluctance to participate and engage. Suggestions for improving stakeholder engagement in future projects were also included. The final section covered the role of the project officer in stakeholder engagement, to gather strategies that if uptaken by the European Commission in future project, could foster product development and uptake, as well as stakeholder engagement.

In total, we obtained responses from **12 different projects**, which were involved in the development of **19 products**. These products ranged on scope, such as more sustainable fishing/aquaculture gears and especially software tools, which addressed needs from different blue economy economic sectors (i.e., renewable marine energies, fisheries, aquaculture) and marine environmental management. These products primarily aimed at providing more fit-for-purpose product that better adapted to end-user needs (58%), develop an innovation that covered a market gap (50%), and comply with legislation (50%). In general, all products made a substantial TRL progress within the context of the project. Most products (except from one) ended on TRL higher than seven, and on average, they raised their TRL in more than 4 levels. One product moved from TRL1 to TRL9 in a 4-year project.



For the development of these products, industrial partners, competent authorities and academia/scientific bodies were the main type of stakeholders involved in the projects. In about two-thirds of the projects, respondents indicated that all segments of the value chain were involved, while one third felt that some segments were missing. **End users participated as stakeholders** in almost all projects (over 90%). This affected positively the product development in many aspects (e.g., define needs, provide feedback, participate in testing and validation of products, etc.).

In about half the participating projects, they have had **previous experience working with the stakeholders involved in the project**, while other **projects relied on good references** or other aspects. Previous relationships were generally seen as beneficial, facilitating faster collaboration, trust-building and effective engagement. Although it was also highlighted that new stakeholders can bring fresh ideas and enthusiasm. Furthermore, for projects in which competent authorities were involved as partners it is noted that they can pose difficulties in innovation. In that sense, it is suggested that rather than leaders should participate as participants, if innovation is not to be developed freely (even when such authorities may be the ultimate end-user).

In most cases, stakeholders were **invited to participate in specific actions** of the project (48%) (e.g., workshops, meetings, interviews, testing and validation of products, etc.), or as members of the advisory board (14%). However, in some projects stakeholders also received funds either as partners (29%) or subcontracted (10%).

Most projects involved some or all **stakeholders from the start**, during the proposal phase (73% vs. 27%). However, the engagement varied in intensity. For most cases it was about informing and/or sharing the proposal for getting feedback, except for those that stakeholders were partners themselves.

The **engagement of stakeholders in product design** was high with 83% of the projects involving them in this process, with scientist and industrial partners internal to the project having a more relevant role. The manufacture of the products was carried out by the consortia themselves in 59% of the cases, while outsourcing was needed in 41% of the participating projects due to not available materials, machinery or capacity. When it comes to testing, 75% of the projects could test the products within the consortia. Although the testing went smoothly for some products, some of the issues that **hindrance the testing process** were the need for adaptation to timing of the stakeholder organization, which was different to that of the project, but also the delays in product development. Although not really important, some projects also indicated weather conditions, problems with the initial product and mismatch between commitment and execution, as other issues encountered throughout the testing phase.



Overall, the level of engagement was mostly rated as “**as expected**” or “higher than expected”, though a minority reported lower-than-expected engagement, often due to limited availability and difficulties to sustain active participation.

The **final product** was the same as initially designed in 27% of the cases but partially changed or completely changed in 45% and 18% of the cases, respectively. The main reasons for the **disparity between the conceptualize product and the final product** were the identification of new aspects that could improve the product throughout the process (39%), the fact that it was a co-creative process (28%) and difficulties encountered in the process that forced modifications (17%).

Despite the hard work behind the development of the products, 50% of them were partially **adopted by end-users** (i.e., part of it, by some stakeholders, or after future partial modification/adaptions), and 50% of the products were **not adopted but could serve as the basis** for future developments. The end of the project is a limiting factor for the adoption process, as at the moment the funding ends, it is difficult to maintain some of the products, specially if those are software based. Similar ratios are indicated as in relation to the product making into the market, where in some cases products are being used by relevant stakeholders, but in other cases the products have been abandoned.

Within the questionnaire, respondents were asked to indicate the level of agreement with different statements that refer to aspects that have proved to be crucial either in the successful or the unsuccessful engagement of stakeholders (Figure 20). Results indicate that **successful stakeholder engagement** is strongly linked to the existence of prior collaborative relationships, shared objectives, and active participation throughout the innovation process. Respondents particularly agreed that engagement was more effective when stakeholders had positive previous experiences working together, were involved from the proposal stage, and participated in the co-creation of the product or solution being developed. A further key factor was the perceived relevance of the innovation: engagement was more successful when stakeholders recognised that the product addressed a concrete need or gap and provided opportunities for positioning, visibility, or technological advancement. The availability of time, resources, and, to a lesser extent, financial support also appeared to facilitate participation.

In contrast, the factors associated with **unsuccessful engagement** tended to reflect the absence of these enabling conditions. Lack of prior collaboration, limited involvement during the early stages of project design, and the absence of shared objectives were frequently identified as barriers. Similarly, engagement was weaker when stakeholders did not perceive the innovation as addressing their needs or providing tangible benefits. While conflicts of interest, lack of resources, and limited funding were mentioned as potential obstacles, these factors appeared to be less influential than issues related to participation, alignment, and perceived value.



Overall, the findings suggest that stakeholder engagement is more likely to succeed when stakeholders are involved from the outset, share common goals, contribute to shaping the innovation process, and clearly perceive the benefits arising from their participation.

Stakeholder engagement was challenging in all projects, and was indicated as being limited by **insufficient capacity**, especially when there is no dedicated funding. Also, it is difficult to secure time from key actors, such as relevant industrial companies or competent authorities, when their **focus may be on other aspects**. These projects are often long, **require long-term commitment**, time-intensive nature of co-creation, and the **need to reach higher TRLs** before market uptake, can limit stakeholder engagement. Additionally, **risks associated with real-world testing without immediate benefits** can reduce industry participation, while organisational changes and procurement decisions based mainly on cost rather than technical suitability can further hinder effective collaboration.

On the opposite side, it has been highlighted the stakeholder engagement provides added value to the products developed, helps understanding of real needs and contexts of use, supports co-creation, validation, and refinement of technical aspects, and helps bridging the gap between research-driven solutions and operational realities. All of these aspects being crucial for fit-for-purpose product development.





Figure 20. Feedback provided by 12 marine EU funded projects as in relation to barriers and enablers for stakeholder movement towards circular solutions

4. Key conclusions and lessons learned

Based on the outputs obtained from all the work carried out within SEARCULAR, as covered in Sections 1, 2, and 3 from this document, the following 20 lessons and conclusions have been obtained.

1. Structuring Stakeholder Engagement within the Project

Designing a dedicated WP for stakeholder management offers clear advantages, such as consolidating engagement activities across different project solutions and ensuring consistency. However, this approach may also create distance from the technical development process, reducing its effectiveness in influencing innovation outcomes. A hybrid approach is therefore recommended: a central WP that coordinates and supports stakeholder engagement activities, combined with strong, direct linkages to technical WPs to ensure continuous feedback integration.

2. Early Involvement of Stakeholders in Proposal Design

Including stakeholders at the proposal stage would improve alignment with real needs and increase the likelihood of adoption of the developed solutions. However, this is challenging due to tight proposal preparation timelines and differing working rhythms between researchers and industry actors. A potential improvement would be to cultivate continuous, long-term relationships with stakeholders, ensuring that their needs and expectations are already well understood before project initiation.

3. Challenges in Stakeholder Engagement

Engaging stakeholders has proven to be complex due to several structural barriers. Limited time and financial resources reduce their willingness to participate, while differing priorities—particularly a lack of alignment between immediate business interests and sustainability objectives—further hinder engagement. As a result, sustainability-driven initiatives may not be perceived as urgent or directly beneficial unless clearly linked to stakeholders' operational or regulatory concerns.

4. Importance of Trust-Based Intermediation

Effective stakeholder engagement is highly dependent on trust. Contact should preferably be established through known intermediaries or individuals with whom stakeholders already have established relationships. Leveraging existing networks and prior collaborations significantly enhances participation rates and openness, as stakeholders are more inclined to engage when trust and credibility are already in place.



5. Clear value proposition for each stakeholder group

Stakeholder engagement is more effective when the benefits of participation are clearly defined for each stakeholder group. These benefits may include access to knowledge, influence over solution design, improved visibility, preparation for future regulatory requirements, or opportunities for market positioning. Engagement should therefore not be framed only around the project's needs, but also around the concrete value that participation can generate for stakeholders.

6. Tailoring engagement formats to stakeholder types

The experience of SEARCULAR shows that engagement formats need to be adapted to the characteristics, interests and constraints of each stakeholder group. Broad, multi-sector events are not always the most effective option, particularly when stakeholders operate in different value chains or may have conflicting interests. Smaller and more targeted formats, such as bilateral meetings, technical workshops, interviews or participation in existing sectoral events, can provide more productive and trust-based interactions.

7. Alignment with Stakeholder Timelines and Availability

It is essential to adapt engagement strategies to the schedules and operational rhythms of stakeholders—particularly industrial actors. Their availability is often constrained by business cycles and seasonal peaks in activity, which can significantly limit their ability to participate consistently in project activities. This requires proactive planning, flexibility in engagement formats, and realistic expectations regarding response times and levels of involvement.

8. Dedicated resources and budget for stakeholder engagement

Meaningful stakeholder engagement requires dedicated time, human resources and financial support. Relying only on goodwill or informal participation can limit the depth and continuity of engagement. Future projects should allocate sufficient resources for coordination, travel, in-person meetings, facilitation, targeted communication and, where appropriate, subcontracting or compensation for stakeholder contributions. Yet, it will always be a challenge, because it is not only about funding. Tedious administrative processes for funding justification often prevent stakeholders from willing to participate as partners in the project.

9. Aligning Sustainability with Stakeholder Priorities

For many stakeholders, sustainability and circularity are not primary drivers of decision-making. Instead, regulatory pressure is often the key trigger for action. Stakeholders are simultaneously dealing with multiple transitions and operational challenges, including energy transition, generational renewal, resource sustainability, declining fish consumption, cost pressures, and poor working conditions. Consequently, sustainability initiatives must be framed in a way that addresses these

broader concerns. Alternatively, the project should include dedicated resources to raise awareness or recognize the priorities of stakeholders when it comes to expected engagement.

10. Managing confidentiality, competition and data-sharing expectations

Along these lines, confidentiality, competition and data-sharing concerns should be addressed from the outset of innovation projects. Both external stakeholders and consortium partners may be reluctant to share information when they perceive commercial, strategic or reputational risks. This creates governance challenges for the consortium, particularly for the coordinator, who must balance collaboration with individual partner interests. Addressing this requires clear governance structures, trust-building mechanisms, and possibly new models for managing shared innovation.

Establishing clear rules on confidentiality, intellectual property, data use and the boundaries between collaboration and competition can help reduce uncertainty and create a safer environment for open exchange.

11. Iterative and Co-Creative Processes vs. Conventional Development

The co-creative, iterative approach adopted in the project has proven to be more time-consuming and complex than traditional, linear development processes. Initially, it was met with some skepticism, including from researchers accustomed to technology-driven development with limited user involvement. However, over time, its benefits became evident, particularly in ensuring relevance and applicability of solutions. Implementing such approaches requires a cultural shift and a pedagogical effort, which is difficult to achieve within typical project time constraints and with limited opportunities for in-person interaction.

12. Value and Effort of Stakeholder Contributions

Despite the challenges, stakeholder contributions have been critical for technical development, real-world testing, and the transfer of practical know-how (particularly regarding materials). However, this collaboration has required significant effort from both researchers and stakeholders. As this was an initial experience for many participants, inefficiencies were inevitable. Future collaborations would likely benefit from the trust built, clearer expectations, and a shared understanding of the level of effort required, thus improving efficiency and outcomes.

13. End-user testing under real operational conditions

End-user participation in real-world testing is essential to validate whether innovative solutions are technically feasible and operationally acceptable. Laboratory results or conceptual designs are not sufficient to demonstrate uptake potential,

particularly in sectors such as fisheries where working conditions, safety, gear performance and handling practices are critical. Testing under real operational conditions helps identify practical limitations, improve design and build confidence among future users. Counting on stakeholders for *in situ* validation from the start is required.

14. Upgrading TRL in the context of EU funded projects

Highly innovative EU funded projects, where product development moves from low TRLs to very high TRLs, require high level of stakeholder engagement in the process and in general, face higher risks. Indeed, the more TRLs are progressed, the higher the probability to face new challenges and obstacles and the need for involvement new stakeholders. Delays in material availability, unexpected testing results, changes in stakeholder commitment or difficulties reaching higher TRLs can all affect progress. Future projects should include adaptive milestones, contingency options and sufficient flexibility in timelines to respond to these risks without undermining the overall innovation process.

15. Social Acceptance and Market Validation

Social acceptance of the developed solutions has not been fully measurable at this stage, primarily because the technologies are not yet fully mature. Current prototypes still face technical limitations, and costs remain prohibitive. Nevertheless, there are strong indications of market interest and potential acceptance:

- In Solution 2, companies such as SELSTAD and F/V Fortuna have expressed willingness to continue developing the ropes.
- In Solution 3, companies including Albacora and Etxebastar have invested their own financial resources in further developing BIOFADs.

These examples demonstrate a clear business case and suggest that, despite existing barriers, stakeholders recognize the potential value of these innovations.

16. Strategic role of early adopters and stakeholder champions

Identifying and supporting early adopters can be decisive for successful stakeholder engagement. When a trusted or influential stakeholder commits to testing or supporting a solution, this can increase credibility and encourage others to participate. These stakeholder champions can act as references, demonstrate feasibility, reduce perceived risk and create a snowball effect that expands collaboration and strengthens the pathway towards adoption.



17. Standardisation, certification and regulatory alignment

The adoption of circular fishing gear will depend not only on technical performance, but also on the existence of supportive standards, certification schemes and regulatory frameworks. Clear and harmonised criteria for circularity, biodegradability, recyclability and EOL management are needed to reduce uncertainty and guide industry investment. Alignment with emerging policy requirements can therefore act as a key driver for stakeholder engagement and market uptake.

For example, in Solution 4, the implementation of Extended Producer Responsibility (EPR) schemes illustrates how policy can drive industry engagement and structural change.

18. Communication and awareness-raising for uptake

Communication and awareness-raising are essential components of the transition towards circular fishing gear. Stakeholders across the value chain, including fishers, manufacturers, consumers, certification bodies and policymakers, need to understand the purpose, benefits, limitations and trade-offs of circular solutions. Clear communication can help increase acceptance, reduce misconceptions and generate demand for more sustainable practices and products.

19. Role of Policymakers and Project Officer in Driving Adoption

Policymakers can play a decisive role in accelerating the adoption of circular solutions (such as circular fishing gear). Particularly, the Project Officer can play a very important role by enabling and supporting stakeholder forums. Establishing a relationship of trust between the Project Officer and the consortium is essential, as their guidance and ability to propose solutions to emerging challenges can significantly enhance project performance and stakeholder involvement.

20. Continuity beyond the project lifetime

The uptake of innovative circular solutions often extends beyond the lifetime of a research project. Even when promising prototypes are developed, additional testing, optimisation, certification, investment or market preparation may be required before full adoption. For this reason, exploitation pathways, ownership of follow-up activities, funding continuity and post-project collaboration agreements should be considered from the beginning of the project.



Annex I. Stakeholder engagement agreement

SEARCULAR Stakeholders' Taskforce

Context

SEARCULAR project aims at reducing the amount of marine litter and microplastics from different European fisheries, and introducing circular economy practices within the fishing sector value chain, including ports.

With this aim, SEARCULAR project will develop, test, and validate 4 close-to-market sustainable and circular solutions from September 2023 to September 2025. **Solution#1** proposes a dolly rope made of recycled polyamide (rPA) from discarded fishing nets; **Solution#2** a certified marine-biodegradable coating for demersal seine ropes; **Solution#3** an eco-designed biodegradable drifting Fish Aggregating Devices (FADs) for tropical tuna purse seine fishery; and **Solution#4** proposes an End-of Life (EOL) fishing gears solution for ports by promoting a replicable management system that enables the pyrolysis of EOL fishing gears for a plastic2plastic application.

In the solutions development, our priority is to respond to the needs of the different stakeholders involved in the fisheries value chain. This means that solutions must be economically affordable/profitable for the industry, technically proficient in the fishing, manufacturing, and recycling operations, respectful for the marine environment and accepted by the different social groups. In other words, fit for purpose and useful.

Given this context, we are seeking participants from different sectors of the fisheries value chain to establish the Stakeholders Taskforce (STF), a community who will contribute to a positive change in the way that fishing resources are caught and that fishing gears interact with the marine environment.

Benefits participating in SEARCULAR's STF

In return for their commitment, STF members may benefit from the following opportunities:

- They will be part of the solution to the problem of plastic pollution in the ocean. SEARCULAR will contribute to the regulatory framework by issuing policy recommendations for European legislation. By participating in the development of alternatives, their voice will be heard and therefore the new gears and processes will match their needs and preferences more easily.
- Improved environmental and social reputation of their company, institution or business sector in general as their name will be associated with good practices and a positive, European effort to reduce plastic waste.

SEARCULAR will gladly increase their visibility by disseminating the work made in social networks and other communication campaigns.

- Improved leadership and innovation position in their sector. The commitment to a circular economy in Europe is strong, with several Directives already in force. By anticipating to the shift, the STF members will be pioneers and innovators, providing something new and unique that can differentiate their product from competitors.
- Access to first-hand quality information such as more accurate definition of what biodegradability and biobased is, what creates pollution, the quality, type and amount of waste gathered to be recycled, design of circular gears, etc.
- Contribute to developing new protocols to deal with EOL (End of Life) gear. By setting the standards and protocols, the market can be shaped in a way that aligns with the STF's strengths and capabilities.

Participating in other research projects is compatible with being a member of the STF of SEARCULAR. We will make sure that attending SEARCULAR events does not interfere with the normal routines, and we will adapt to the members' yearly operations schedule.

Expected impact

Successful completion of the project will result in:

- Reduced contribution of tropical purse seine, demersal seine and trawl fisheries to generating marine litter and microplastics.
- Increased choices of circular fishing gears in the market.
- Increased acceptance of circular solutions and circular economy by the wide community of European fisheries value chain.
- Reduced demand for raw polyamide and polyethylene.

Who will be member of the Stakeholder Taskforce?

Participants will be experts with a vision about the future of the fishing sector and aware of the emerging concerns on plastic pollution.

A diverse range of members will be invited to be part of the STF. Their varied expertise and perspectives will guarantee that contributions are representative of the European fisheries value chain, namely:

- Gear manufacturers and recyclers,
 - National and European policy makers,
 - Port authorities,
 - Environmental NGOs,
- 

- Marine scientists and research organisations.

Purpose of the Stakeholders Taskforce

Our vision is that the Stakeholders Taskforce becomes a team integrated in SEARCULAR, working side by side with SEARCULAR consortium.

The purpose of the Stakeholders Task Force is to collaborate in the joint development of the solutions, providing SEARCULAR with feed-back, insights and guidance.

More specifically, the objectives of this board will be to:

- 1) Jointly propose ways to test the solutions, together with SEARCULAR members.
- 2) Give feed-back so that researchers can integrate improvements into upgraded versions of the solutions.
- 3) Contribute to ease the acceptance of these solutions in their respective industries or communities and therefore increase future implementation.

Role and commitment

Participation in workshops. Members of the STF will be invited to deliver strategic inputs based on their technical expertise and their vision of future developments within each sector so that the solutions respond to the real needs of the market /users.

If they are held in person, SEARCULAR will cover travel and subsistence costs.

During the three years of the project, the attendance to the following 1-day workshops is expected:

Workshop 1 will present the project and will explore your **needs, preferences and expectations** with regards to the circular solutions of SEARCULAR. It will be a first opportunity to get your feed-back about SEARCULAR's approach, suggest changes and confirm a calendar of interactions with the researchers for the subsequent product development and tests. It will be held at an agreed date in 2024.

Workshop 2 will showcase the solutions to the wide community of users. Additionally, it will explore (1) potential incentives schemes to facilitate the adoption of the new technologies and their integration with existing and new policies, (2) ways to technically implement both the circular gears and processes, and (3) strategies to extend the solutions to end-users through advocacy, capacitation, and communication. It will be held at the end of the project, in the second semester of 2026.

Contribution to product/service development. Following workshop 1, where members will get to know the details of each solution, the STF members will be invited to take part in the solution development at different moments of the process.

SEARCULAR researchers will contact the STF members for various topics such as:

- Design experiments to test hypothesis about technical performance, functionality, usability, durability, scalability, etc, of the solutions.
- Discussing results of the laboratory or at sea tests, identifying defects and suggesting improvements for an upgraded version of the solutions.
- Prioritizing and validating key features of the solutions.
- Providing insights and advice when facing technical challenges.

Additionally, in the case of port-based solution model to facilitate the management and valorisation of EOL fishing gears, SEARCULAR would appreciate an expert view in:

- The design of the model according to the industry's necessities,
- The validation of the pilot "Blue point" in one port of the Bay of Biscay area, and
- The oil quality resulting from the pyrolysis of fishing net rejects and its potential application to produce new polymers.

The feed-back and insights will be gathered in specific templates.

Interaction and communication

Requests may vary from a rapid advice to more formal discussion sessions. Depending on the scope and goal, consultation formats will include email exchange, online surveys, interviews, working sessions, etc. and specific communication channels or platforms will be set up if needed. The timing will avoid critical periods of heavy workload for members of the Stakeholders Taskforce.

Impact of the STF contribution will be highlighted by SEARCULAR's communication experts at project meetings, workshops, and social media. Additionally, the STF will receive newsletters with updates on the progress of the project and updating sessions can be organized remotely if requested.

Timing and next steps

The role will last from January 2024 to September 2026.



Annex II. Questionnaire for direct stakeholder engagement

Place:

Date:

SEARCULAR – fishers, workers, skipper, ship owners

Description

Objective. This questionnaire has been elaborated within the context of the SEARCULAR project (funded by the European Commission). It aims to find out the priorities of the fishing sector, as well as the barriers and opportunities that exist in the field of sustainability and gear management. **Confidentiality.** This is not an anonymous survey, but we commit to the aggregate and collective treatment of the information collected and to its use only within the scope of the SEARCULAR project. **Data storage.** The data will be stored in AZTI's databases until the end of the SEARCULAR project. Access to this data will be protected, with the persons involved in the research having access to this information. The storage of data after the end of the project will be maintained only if it is necessary to process the data for purposes related to this project. Under no circumstances will the data obtained be shared with third parties, remaining at all times in AZTI's databases and confidential. **Duration.** This questionnaire will have an estimated duration of 10 minutes.

- ☐ Please tick if you are willing to participate in this study.
- ☐ Please tick if you want to be informed about the results of this study.



Characterisation of the participant

1. Company:
2. Age:
3. Segment:
 - ☐ Policy makers - responsible
 - ☐ Policy makers – technical staff
 - ☐ Ports - responsible
 - ☐ Spring Guards
 - ☐ Fishermen association
 - ☐ Ship owners
 - ☐ Skippers
 - ☐ Technical staff (sailor, factory/port worker, etc)
 - ☐ Marine waste manager
 - ☐ Recycling worker
 - ☐ Material manufacturer
 - ☐ Fishing gear manufacturer
 - ☐ Fishing gear assembler
 - ☐ Canneries
 - ☐ Seller (intermediate)
 - ☐ Final seller
 - ☐ Consumer
 - ☐ Others (please specify)
4. Number of years involved in this sector

Context

5. In your business, what are the main challenges you face? *(List and prioritise them from highest to lowest priority)*

Challenge 1.

Challenge 2.

Challenge 3.

Challenge 4.

Challenge 5.

Fishing gear sustainability

6. Have you ever heard of the term “sustainable fisheries”?
 - ☐ Yes *(go to question 7)*
 - ☐ No *(go to question 8)*

7. What does it mean “sustainable fisheries” to you? *(open question)*
8. In SEARCULAR, we consider “sustainable fisheries” those that aim to be selective (e.g., avoid bycatch), minimize environmental impact (e.g., ghost fishing; damage on the seabed, etc.), use biodegradable materials and long lasting gears, minimize litter or microplastic generation and/or other aspects.

In relation to this topic, please indicate how sustainable is the fisheries in which you are involved *(1: lowest - 10: highest level)*.

1 2 3 4 5 6 7 8 9 10

Not sustainable

Highly sustainable

9. Why did you select this value? *(e.g., I marked a 3 due to high energy consumption, which contributes to pollution; I marked a 8 because it is very selective and I do not see any major adverse effect...)*.

Your fishing gear

10. Which is the gear you work with? *(If you use more than one, please, indicate the one you work with more along the year)*
11. Taking into account the gear that you use most, please indicate your level of agreement with the following statements:

Item	I fully disagree	I partially disagree	Neither agree nor disagree	I partially agree	I fully agree	I don't know
It has good social acceptance	1	2	3	4	5	
I receive financial incentives to use this gear	1	2	3	4	5	
It is easy to purchase	1	2	3	4	5	
In case of damage, it is easy to find replacements (full or parts) and it is easy to repair	1	2	3	4	5	
It has a long service life. <i>How long?</i>	1	2	3	4	5	
It is easy to handle by technical staff	1	2	3	4	5	
The capture - effort relationship is good	1	2	3	4	5	

Its use is energy efficient	1	2	3	4	5	
It is selective (i.e., low bycatch, or impact on seafloor).	1	2	3	4	5	
It is easy to manage at the end of its life cycle	1	2	3	4	5	
Parts of the gear are recycled	1	2	3	4	5	
Other advantages (please, specify)						

12. If you were to change your gear (part of it or completely), what would be the **THREE** key features that would make you opt for these alternatives? *Select 3 from the following list:*

- ☐ Better social acceptance (good image)
- ☐ Financial incentives availability
- ☐ Easier to purchase
- ☐ Easier to repair and to find replacements / spare parts
- ☐ Longer life span
- ☐ Easier to handle for staff
- ☐ Better fishing performance (capture – effort relationship)
- ☐ More energy efficient
- ☐ Lower interaction with species other than target species (reduce bycatch, impacts on the seabed, ...).
- ☐ Easier to manage at the end of its life cycle
- ☐ Easier to recycle the different gear components
- ☐ Others (specify)

13. What do you do with the gears at the end of their life cycle?

14. If you have a blue point for discarded fishing gears, or if you where to have one, which features do/would you need for you to use it and manage your gears properly?

15. Please elaborate on any aspect or share any information you consider relevant.

We thank you very much for your collaboration



Annex III. Questionnaire design to collect Solutions' leads perspectives on stakeholder engagement for direct stakeholder engagement





SEARCULAR: WP5-interaction and solution development with stakeholders

Cuando envíe este formulario, no recopilaremos automáticamente sus detalles, como el nombre y la dirección de correo electrónico, a menos que lo proporcione usted mismo.

1. In which WP do you work? 

☐ WP1

☐ WP2

☐ WP3

☐ WP4

2. With how many stakeholders have you engaged in the process of the solution development? 

3. How did stakeholders receive the proposal to work collaboratively to develop the solution? If different experiences with different stakeholders, please specify. 

4. How frequently have you met with your key stakeholders (phone, email, meetings,...)? 

☐ More than once a week

☐ Once a week

☐ Every other week

☐ Once a month

☐ Less than once a month

5. Please, develop your answer in the previous question. Has this frequency been enough to achieve the objectives? What would you have needed? 

[Siguiendo](#)

 Microsoft 365

Este contenido lo creó el propietario del formulario. Los datos que envíe se enviarán al propietario del formulario. Microsoft no es responsable de las prácticas de privacidad o seguridad de sus clientes, incluidas las que adopte el propietario de este formulario. Nunca des tu contraseña.

Microsoft Forms | Encuestas, cuestionarios y sondeos con tecnología de inteligencia artificial [Crear mi propio formulario](#)

[Privacidad y cookies](#) | [Términos de uso](#)



SEARCULAR: WP5-interaction and solution development with stakeholders

Cuando envíe este formulario, no recopilaremos automáticamente sus detalles, como el nombre y la dirección de correo electrónico, a menos que lo proporcione usted mismo.

1. In which WP do you work? 

☐ WP1

☐ WP2

☐ WP3

☐ WP4

2. With how many stakeholders have you engaged in the process of the solution development? 

3. How did stakeholders receive the proposal to work collaboratively to develop the solution? If different experiences with different stakeholders, please specify. 

4. How frequently have you met with your key stakeholders (phone, email, meetings,...)? 

☐ More than once a week

☐ Once a week

☐ Every other week

☐ Once a month

☐ Less than once a month

5. Please, develop your answer in the previous question. Has this frequency been enough to achieve the objectives? What would you have needed? 

[Siguiendo](#)

 Microsoft 365

Este contenido lo creó el propietario del formulario. Los datos que envíe se enviarán al propietario del formulario. Microsoft no es responsable de las prácticas de privacidad o seguridad de sus clientes, incluidas las que adopte el propietario de este formulario. Nunca des tu contraseña.

Microsoft Forms | Encuestas, cuestionarios y sondeos con tecnología de inteligencia artificial [Crear mi propio formulario](#)

[Privacidad y cookies](#) | [Términos de uso](#)

Annex IV. Questionnaire to collect marine EU funded projects' perspectives on stakeholder engagement

Objective. This questionnaire has been elaborated within the context of the SEARCULAR project (funded by the European Commission). It aims to identify the challenges faced in EU-funded projects with regards to stakeholder engagement, specifically in the process of product development. **Anonymity/Confidentiality.** This is NOT an anonymous survey, in the sense that we would like to be able to contact the people in case of follow-up questions are needed, but we commit not to publish names of people, in any publications that may result from this research. In all cases, respondents will receive manuscripts before publications, to check on how information has been treated, in case modifications are needed. **Data storage.** The data will be stored in AZTI's databases until the end of the SEARCULAR project. The storage of data after the end of the project will be maintained only if it is necessary to process the data for purposes related to this project. Under no circumstances will the data obtained be shared with third parties, remaining at all times in AZTI's databases. **Duration.** This questionnaire will have an estimated duration of 10 minutes.

- ☐ I agree to participate in this study.
- ☐ I would like to be informed about the results of this study.

1. Selection of project

For the purpose of answering this survey, we would like you to think of **ONE project (ideally EU funded)** in which you have made stakeholder engagement for the development of a product Please, think about it, and answer the questionnaire focusing all the time in this project and product.

Name of EU-funded project that you represent *(text)*:

Project development years: *Year - Year*

Name of product developed *(text)*:

Starting TRL¹ of the product *(select)*:

¹ Technology Readiness Levels (TRLs)

TRL 1 – Basic principles observed

TRL 2 – Technology concept formulated

TRL 3 – Experimental proof of concept

Final TRL¹ of the product (*select*):

2. 2. The product

The product developed in the scope of the project was... (*select*):

- An improvement over an existing product
- A completely new product

The aim of this product was to...

- Comply with legislation
- Develop an innovation to cover a market need
- Have a product that is more fit-for-purpose for end-user use
- Obtain a more sustainable product
- Reach a cheaper product
- Other (please, specify)

3. 3. Stakeholders in the project

Please, select from the list below the stakeholders (*i.e., person, group, or organization that has an interest in the development of the project/product, and is affected by the resulting outcomes*) that were highly involved in the product development (from the design to the adoption/marketing of the product) (*multiple choice*)

- Consumer
- Industrial partners (e.g., fishing sector, canneries, manufacturers, ...)
- Academia/scientific bodies
- Competent authorities
- NGOs
- Other (please, specify)

If you think of your final product, would you consider that all the different segments of the value chain (*i.e., from product development to user/consumer*) were involved? (*Yes/No (e.g. only researchers were involved)*)

- If not, how did it affect to the project? (*text*)

If you think of your product, did some end users participate as stakeholder? (*Yes / No*)

- In not, how did it affect to the project ? (*text*)

TRL 4 – Technology validated in the lab

TRL 5 – Technology validated in a relevant environment

TRL 6 – Technology demonstrated in a relevant environment

TRL 7 – System prototype demonstrated in an operational environment

TRL 8 – System complete and qualified

TRL 9 – Actual system proven in operational environment

In which form were stakeholders involved in this project? *(multiple choice)*

- ☐ Partner
- ☐ Subcontracted
- ☐ Advisory board
- ☐ Invited to certain activities
- ☐ Other

Please, develop your answer *(open question)*

In **general**, how strong was the stakeholders' engagement? Please, select the most representative answer *(Select)*

- ☐ Lower than expected (e.g., invited to participate, but didn't collaborate; they didn't comply with their compromise; etc.)
- ☐ As expected, according to their roles as partner, subcontractor, advisory board, etc. (e.g., when being a partner, they did what it was expected).
- ☐ Higher than expected (e.g., provided in-kind support; convinced other stakeholders to participate; invested own economic and human resources for different phases of the product development; etc.)

Please, develop your answer if needed *(open question)*

Did you (or other partners of the consortia) had previous relationship with some or all these stakeholders? *(multiple choice)*

- ☐ Yes, we had previously worked together *(ramification)*
- ☐ Yes, but we had not worked together
- ☐ No, but we had good references
- ☐ No, they were new stakeholders
- ☐ Other (please, specify)

How do you think your previous existing or non-existing relationship affected the engagement and product development? *(open question)*

4. 4. Stakeholder engagement in the proposal preparation

Did stakeholders engage in the proposal phase?

- ☐ Yes, all of them
- ☐ Yes, some of them
- ☐ No
 - If yes, in which form?
 - ☐ They were informed about the project
 - ☐ They were informed about the project and provided a letter of support
 - ☐ Proposal was shared with them, but wasn't open to their contributions
 - ☐ Proposal was shared for their contributions, but no feedback was obtained

- Proposal was shared for their contributions; they provided feedback, but this feedback was not taken on board
- Proposal was shared for their contributions; they provided feedback, and this feedback was taken on board
- They were partners in the project
- Other *(please specify)*

5. Stakeholder engagement in product testing

Were stakeholders involved in the product testing?

- Yes, all of them
- Yes, some of them
- No

When it came to product testing, the main issues were *(select)*:

- We did not have the capacity to test within the consortia.
- A (several) partner/s had committed to test the product but did not do so.
- A (several) stakeholder/s had committed to test the product but did not do so.
- We needed to subcontract others to carry out the testing
- There were delays on the product development, which did not leave enough time for testing (full or partial testing).
- Budget was limited and was not enough for testing as required
- We had to adapt to external timing to test, rather to the project timing and needs.
- External factors (e.g., weather conditions, problems with machinery, clashing timing with other activities of the companies, insufficient time, etc.) did not allow testing in the way that was needed.
- Initial tests failed, and we did not have time / resources to repeat
- There were no issues, the testing went smoothly
- Others (please, specify)

6. Product adaptation

Was the final product the same as initially designed?

- Yes, it was the same
- Yes, but it was partially adapted
- No, it was different

Why?

- The initial product already existed
- We realised that the way the product was conceptualised would not succeed in the market

- We could not access the materials needed, thus we could not achieve the TRL expected
- The materials used did not work as expected
- We could not find a provider for the materials needed
- It took longer than expected to develop, and therefore, for funding justification we had to simplify the final product
- Difficulties emerged in the process (e.g., technical, changes in legislation, etc.), which imply adaptation and modification
- We identified new aspects that could improve the final product
- It was the result of a co-creative process with stakeholders
- Nobody was showing interest to take the product and use it, we adapted.
- Others

Was the final product adopted by stakeholders? (*select*):

- Yes, fully
- Yes, partially
- Yes, partially modifying some aspects
- No, but provided the basis for future developments
- No, it was not taken on board.

Could you develop this answer? (*Open question – text*)

Apart from the issues highlighted, what other issues hindrance the process? (*Open question – text*)

Would you consider that the product has successfully made into the market? (*Yes/No/NA*)

7. Positive and negative engagement

Successful engagement:

From the stakeholders involved, please select the ones with which you had a more successful engagement (*multiple choice*)

- Consumers
- Industrial partners
- Academia/scientific bodies
- Competent authorities
- NGOs
- I did not have positive engagement with any stakeholder
- Other (please, specify)

Please, from the statements below, please indicate your level of agreement with them, as in relation on how these aspects affected the successful engagement (*Likert score*). We had a successful engagement because....

—

- We had positive experience working together in the past
- They were engaged from the proposal phase.
- They were official members of the consortium with compromises to be met.
- We had shared objectives and drivers generating a high level of complicity
- There were no conflicting interests between stakeholders involved in the project
- We selected the product to be developed together.
- The product under development covered a gap/need that they had.
- The product obtained was a result of a co-creative process.
- The product developed represented an opportunity for positioning in general.
- The product developed represented an opportunity for positioning in the market.
- The product developed represented an opportunity for positioning in the public opinion.
- The product developed represented an opportunity for positioning in technology readiness.
- They had time/resources availability
- They received funding for participating.

Please, use this space to provide details on any of the aspects above (or new ones that have not been covered) (*open question*)

Unsuccessful engagement:

From the stakeholders involved, please select the ones with which you had the least successful engagement (*multiple choice*)

- Consumers
- Industrial partners
- Academia/scientific bodies
- Competent authorities
- NGOs
- I did not have un successful engagement with any stakeholder
- Other (please, specify)

Please, from the statements below, please indicate your level of agreement with them, as in relation on how these aspects affected having a less successful engagement (*Likert score*). We had a less successful engagement experience because....

- We had not worked together previously, and it was hard to connect
 - They were not engaged in the proposal phase.
 - They were not official members of the consortium.
 - We did not share objectives and drivers, generating divergence.
- 

- There were conflicts of interest between stakeholders involved in the project.
- We did not select the product to be developed together.
- The product under development did not cover a gap/need that they had.
- The product obtained had not been co-created.
- The product developed did not represent an opportunity for positioning in general.
- The product developed did not represent an opportunity for positioning in the market.
- The product developed did not represent an opportunity for positioning in the public opinion.
- The product developed did not represent an opportunity for positioning in technology readiness.
- They did not have time/resources available.
- They did not received funding for participating.

Please, use this space to provide details on any of the aspects above (or new ones that have not been covered) (*open question*)

8. Project Officer

How important has been for you the involvement of the project officer in stakeholder engagement?

- Extremely not important
- Somewhat not important
- Neutral
- Somewhat important
- Extremely important

How much has the officer promoted stakeholder engagement?

- Less than expected
- Normal involvement
- More than expected

The impact of such level of officer involvement has been...

- Negative
- Neutral
- Positive

Indicate specific actions carried out by the officer that have resulted in positive interactions with the stakeholders.



9. Future

If you could have changed something along the process, with regards to stakeholder engagement, what would have been? Do you have any advice to improve/secure stakeholder engagement? *(text)*

10. Other projects

Could you please suggest other projects in which there has been product development with stakeholders?

11. Contact

If you would like to receive the manuscript prior to submission, please provide your email contact below (xxx@xxx.xx)



Contact

For any enquiries, please contact:

Carolina Alonso
calonso@azti.es

Maria C. Uyarra
mcuyarra@azti.es



**Funded by
the European Union**



**UK Research
and Innovation**

Funded by the European Union under grant agreement No 101112852. The project has also received funding from UK Research and Innovation (UKRI). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union, the European Climate, Infrastructure and Environment Executive Agency or UKRI. Neither the European Union, the granting authority nor UKRI can be held responsible for them.