



AQUA-LIT

AQUACULTURE MARINE LITTER MANAGEMENT



ACTION PLAN
CANARY ISLANDS

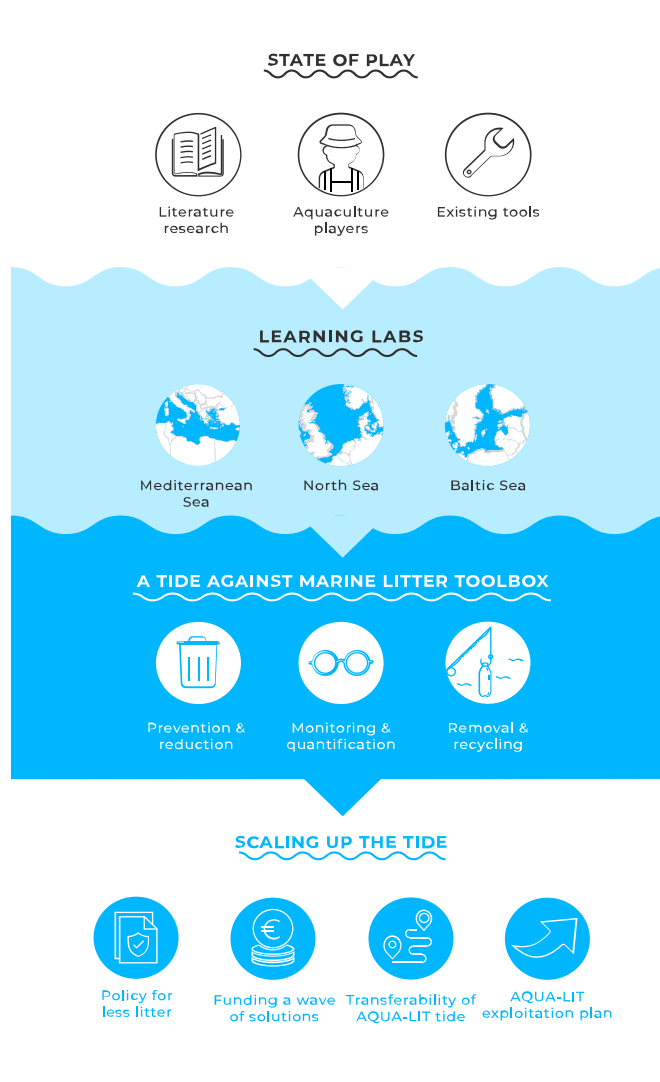
AQUA-LIT project

AQUA-LIT is an EASME-EMFF funded project that aims at providing the aquaculture sector with a sustainable **toolbox** of innovative ideas and methodologies to address the 3 main components of marine littering: **prevention & reduction, monitoring & quantification, and removal & recycling.**

To fulfil this mission, we will be working face-to-face with aquaculture farmers in three **regional Learning Labs**: at the **Mediterranean basin, the North Sea and the Baltic Sea regions.** In parallel, we will identify and cluster existing, upcoming and already implemented tools on marine littering, and we will further **develop a platform and an app** for providing the **'Tide against marine litter toolbox'.**

Lastly, we will **'scale up the tide'** by developing the **'policy for less litter'** set of recommendations, by showcasing the **'funding a wave of solutions'** available for the sector and by coming up with a **transferability plan for outermost regions.**

Through this, we expect to help all stakeholders from the aquaculture chain to increase the understanding, awareness and availability of solutions, so a potential **transformation of the aquaculture sector towards a less polluting sector** can become possible.



Project Consortium



Geonardo Environmental Technologies
(**GEO**)



European Centre for Information on Marine
Science and Technology (**EurOcean**)



Vlaams Instituut voor de Zee - Flanders
Marine Institute (**VLIZ**)



Sustainable Projects GmbH (**s.Pro**)



Instituto Español de Oceanografía - Spanish
Institute of Oceanography (**IEO**)



Société d'Exploitation du Centre National
de la Mer - French National Sea Centre in
Boulogne-sur-Mer (**Nausicaa**)



Fundo Regional para a Ciência e Tecnologia
- Regional Fund for Science and Technology
(**FRCT**)

Executive Summary

Being the focus of the AQUA-LIT project centred on the Mediterranean, Baltic, and North Sea regions, the identified barriers, solutions, and recommendations developed for good management and prevention of marine litter from aquaculture activities are specific to the context and situation of the above-mentioned sea basins. However, **common barriers have been identified across the three sea basins, and several solutions and general recommendations have the potential to be applicable in other sea basins in Europe.** The AQUA-LIT transferability task has the aim to present main results and outcomes and transfer knowledge acquired during the entire lifespan of the project to stakeholders from EU outermost regions and other European sea-basins, not included in the focus of the project.

This document focuses on the transferability process to the Canary Islands. The aquaculture sector in the Canary Islands is in rapid expansion; for this reason, **the current action plan considers such context** and gathers solutions, measures, and policy recommendations that could potentially be applied also to this region's context. **A webinar with previously identified stakeholders have been carried out in the local language (Spanish),** in order to present the AQUA-LIT Toolbox, give a preview of their respective action plans and gather their feedback.

Measures, solutions, and recommendations described in the action plan can provide a base for a more efficient marine litter management in the Canary Islands' aquaculture.

1. Introduction

Every year, millions of litter tonnes end up in the ocean worldwide, posing environmental, economic and health problems. It is estimated that over 150,000 - 500,000 tonnes of macro-plastics and between 70,000-130,000 tonnes of microplastics are dumped in the sea every year only by Europeⁱ. Ocean-based sources account for 20% of this plastic pollutionⁱⁱ, such as overboard discharges from ships, and fishing and aquaculture gear abandoned, lost, or otherwise discarded.

Considering that aquaculture is the food-producing sector with the fastest growing, accounting already for 50% of the world's fish that is used for feedingⁱⁱⁱ, and having in consideration the European priority for doubling EU's production by 2030, we believe that this **aquaculture industry growth could act as a precursor, by implementing preventive measures and innovative solutions to manage non-organic waste, which could become an example and lead the way for other sectors.**


Despite the work developed under the AQUA-LIT has been carried out with the aquaculture stakeholders across the North, Baltic, and Mediterranean Seas, **we believe that many of the solutions and measures could be transferred to other regions in Europe.** Therefore, action plans for the Portugal Mainland, Azores, and Canary Islands were developed, as these regions were identified as relevant for the transferability process, for different reasons as described below.



Figure 1- Regions to which AQUA-LIT results were transferred.

For the purpose of this document, the focus will only be placed at the Canary Islands. If interested in the Action Plan for Portugal Mainland and Azores Islands, then it can be consulted at:

<https://aqua-lit.eu/toolbox/action-plans-and-policy-recommendations>

Region		Reason	Aim
Canary Islands		Canary Islands are a relevant region in terms of aquaculture, being at 3rd place in Spain for finfish production . The plan is to expand the sector, with the production of new species (e.g. shellfish).	Transfer policy recommendations and possible ideas and solutions for the prevention, monitoring, and reduction of marine litter from the aquaculture sector, to implement into the already existing exploitations.

In general, the aquaculture sector has been considered in the outermost regions a **promising sector within the Sustainable Blue Growth strategy, with potential growth drivers**.

“We identified significant growth drivers: stakeholders in the Azores could leverage the ‘Azores brand’ to market locally caught or produced seafood, and the ‘accelerated licensing procedure’ for aquaculture operations in the Azores offers good investment conditions. Furthermore, in the Canary Islands there are several species with great potential for future use in aquaculture”

— *Realising the potential of the Outermost Regions for sustainable Blue Growth, EC, 2107.*

Moreover, the **European Commission, specifically under the EMFF programme**, has planned **Strategic action plans** covering structural investment in the fishery and **aquaculture sectors**, financial compensation for additional costs and investments in the sustainable blue economy to achieve a sustainable coastal development, as response for the current COVID-19 crisis in the outermost regions (<https://webgate.ec.europa.eu/maritimeforum/en/node/4733>).

A specific transferring process has been carried out for the Canary Islands, being divided into five phases:

1. **Relevant stakeholders' identification**
2. **Literature review and online survey**
3. **Targeted solutions identification**
4. **Webinars**
5. **Action plans development**

In this report we will firstly detail the Transferability Process by phase (Chapter 2). Action Plan targeted to the Canary Islands in Chapter 3, including an introduction to general barriers for an efficient marine litter management, suggestions on measures and solutions, and a general overview of policy recommendations, with a direct link to the full report available in AQUA-LIT website. An introduction to the Toolbox is given in Chapter 4, followed by general conclusions (Chapter 5).

2. Transferability process

As above-mentioned, a targeted AQUA-LIT results transferability process has been carried out for three regions: Portugal Mainland, Azores and Canary Islands. The process was divided into five phases, as described below. Other regions, such as the Black and Celtic Sea, have been targeted instead through a webinar in English, in which the AQUA-LIT main results and Toolbox have been presented.

Relevant stakeholders' identification

In order to ensure a direct and effective knowledge transferability, relevant aquaculture stakeholders from Portugal Mainland, Azores and Canary Islands were identified, taking advantage of AQUA-LIT partners EurOcean, FRCT and IEO networks. These stakeholders included aquaculture farmers, policy makers and researchers in the aquaculture field, and have been selected as potential targets for the AQUA-LIT knowledge transfer.

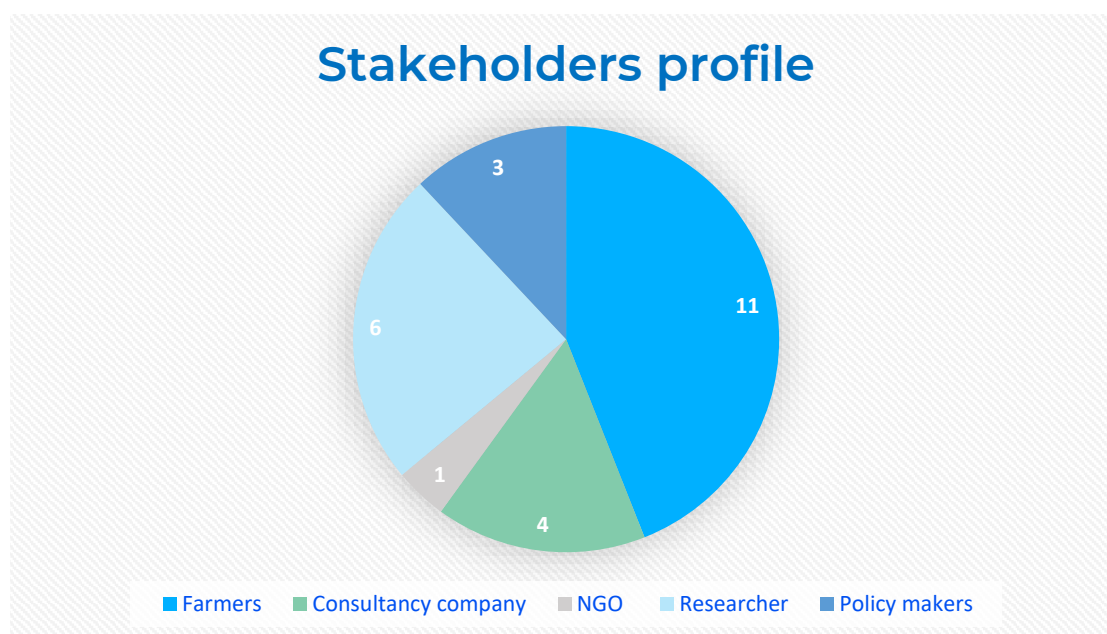


Figure 2— Identified stakeholders' profile.

Stakeholders identified have been contacted via email firstly in July 2020, to inquire them about their interest in engaging on a voluntary transfer process, which would include a one-hour webinar and an online survey (presented in the chapter below). Stakeholders have been contacted again in September and October 2020 for scheduling the webinar. To ensure an inclusive engagement of local stakeholders, the entire communication and the survey were done in the stakeholders' language (Portuguese and Spanish).

Literature research and Online survey

For a preliminary background information, a comprehensive literature review was carried out on the current situation of the aquaculture sector in the Canary Islands. In order to complement the literature review, a short survey was sent while contacting the identified stakeholders for the first time.



Survey targeting Canary Islands stakeholders (farmers):

1. ¿En qué tipo de establecimiento de acuicultura trabaja?
(Especificar especies producidas y técnica utilizada)
2. ¿Cuál es el tamaño de su empresa pequeño, mediano o grande)?
3. ¿Tiene un sistema de seguimiento de residuos no orgánicos que se producen en su establecimiento?
4. ¿Envían residuos no orgánicos a un centro de reciclaje?
5. ¿Su empresa tiene alguna certificación ambiental?
6. ¿Qué legislación existe actualmente en relación con la gestión de residuos en el sector de la acuicultura en su región?
7. ¿Qué tipo de análisis de impacto en el medio ambiente se imponen actualmente para el sector de la acuicultura en su región?



Survey targeting Canaries Islands stakeholders (policy makers, consultancy, NGOs, researchers)

1. ¿Cuál es el tipo de acuicultura más practicada en las Canarias? (Especificar especies producidas y técnica utilizada)
2. ¿Qué legislación existe actualmente en relación con la gestión de residuos en el sector de la acuicultura en su región?
3. ¿Qué legislación existe actualmente en relación con la gestión de residuos en el sector de la acuicultura en su región?
4. ¿Qué tipo de análisis de impacto en el medio ambiente se imponen actualmente para el sector de la acuicultura en su región?

Targeted solutions identification

Based on the information gathered through surveys and the literature review, several solutions from the AQUA-LIT results were identified as relevant and potentially applicable to these regions' context. A preliminary list of solutions was prepared to be presented to the stakeholders during the transferring webinars, being updated afterwards, taking into consideration the information's shared by the stakeholders in the webinars.

The full list of potential solutions for each targeted region, has been provided in each respective action plan.

A summary of the [Policy recommendations](#), developed under Task 5.2, have been presented in each of the targeted webinars, and the full report link included in the action plans.

Webinar

A **targeted webinar** was carried out in **Spanish** with the identified stakeholders.

The aim of the webinars was to:

- 1) Present **AQUA-LIT general aim and results**
- 2) **Introduce** the identified stakeholders to **the AQUA-LIT Toolbox**, with a general explanation of the structure, content, functionalities, and a virtual tour.
- 3) Present examples of **solutions with potential applicability in their regional context**.
- 4) Present a summary of the **Policy Recommendations**.
- 5) **Direct engagement with the identified stakeholders** and gathering of feedback and information.

The webinar therefore included a general presentation of AQUA-LIT project and main findings, a presentation and a **virtual tour of the Toolbox**, examples of solutions included in the **action plan for each region**, and a **general summary of Policy Recommendations**. These online webinars were interactive and provided space for the stakeholders to speak and share their knowledge. Some important points highlighted by the stakeholders have been taken into consideration when finalising the action plans.

The **webinars recordings are available in the [AQUA-LIT Media centre](#)**, and will be available up to 5 years after the termination of the project.

The participants in the three webinars included people from five type of stakeholder groups as shown in the figure and pie chart below.

			
Stakeholder type	Webinar PT	Webinar ES	Webinar ENG
Aquaculture farmers	3	1	
Policy makers	1		
Researchers	2	2	
NGOs		1	4
Unknown		1	2

Figure 3— Number and type of stakeholders than participated in AQUA-LIT’s transferability webinars.

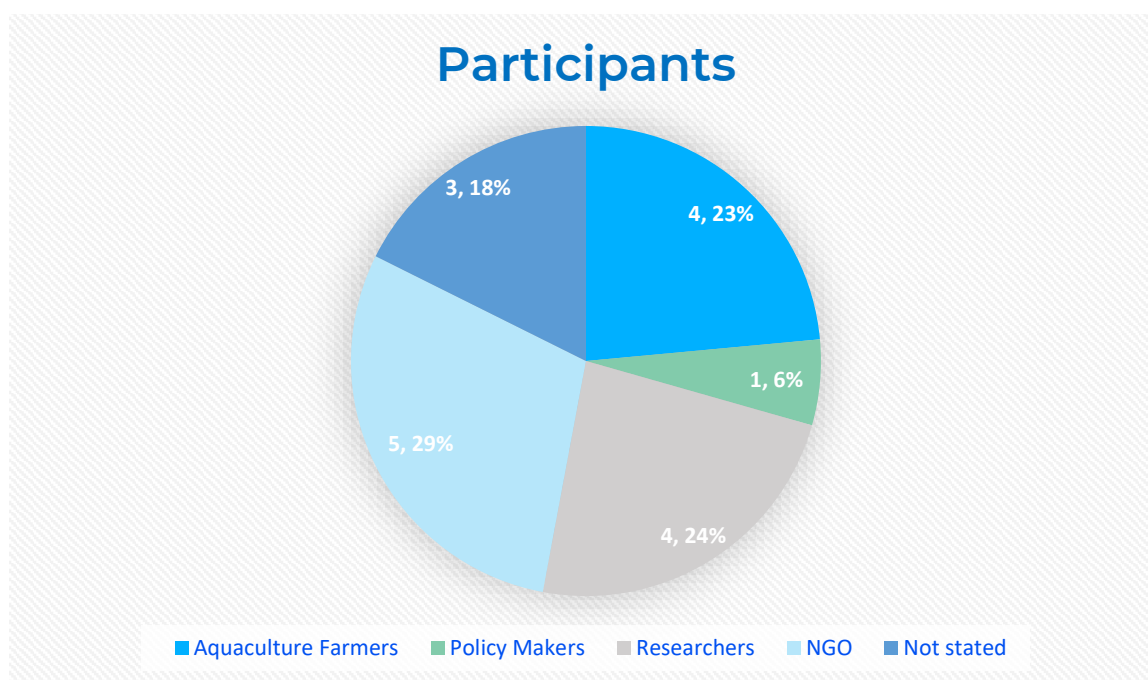


Figure 4— Number and type of webinar participants.



Figure 5— Promotion flyer of the Spanish transferability webinar

Webinar accessible here: <https://www.youtube.com/watch?v=QOko9spTNgM&t=4s>

Action plan development

Based on the information gathered through the literature review, the surveys, and the webinars, the action plan was developed, which include suggestions on solutions, measures and policy recommendations for the Canary Islands. The Action plan includes a general introduction with possible barriers to an effective marine litter prevention, reduction and management identified in the other European sea basins under analysis (Mediterranean, Black and North Sea Basins), and possibly applicable to the Canary Islands.

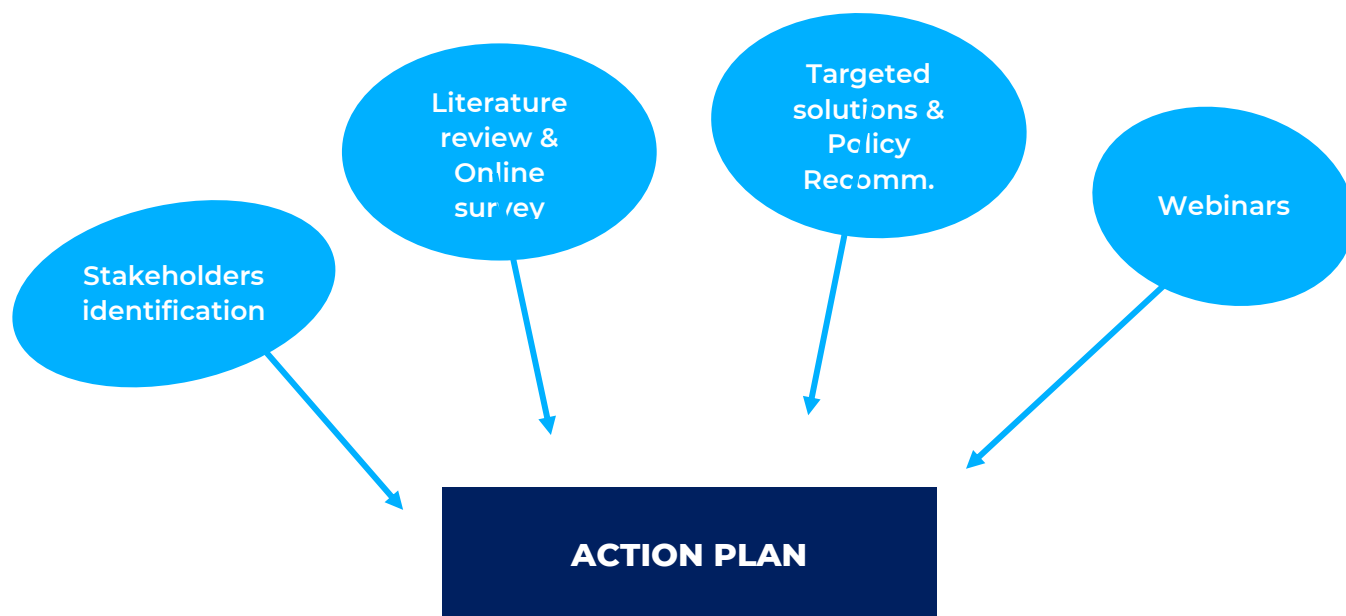


Figure 6— Process for creating the Action Plan.

3. Action Plan

In this chapter, a general overview of common barriers for an effective marine litter management is given, followed by a series of solutions and practices potentially applicable in the Canary Islands. A general overview of policy recommendations that could be applied to each region is then provided, with links to the full report ([Deliverable 5.1](#)).

3.1. Introduction: possible barriers to an effective marine litter prevention, reduction, and management

During the analysis phases of the project, specific barriers for an effective marine litter prevention, reduction, and management were identified for each sea basins. However, **some barriers were identified applicable to many regions, and therefore interesting to take into consideration also for the Canary Islands context**. These barriers have been identified for three types of production - finfish, shellfish, and seaweed aquaculture. Barriers identified consider offshore and coastal practices, not inland nor freshwater ones.

The barriers can be summarised as follow:



FINFISH AQUACULTURE:

- Adverse weather conditions cause the rupture of equipment and often the loss of small or even big items.
- The fouling species (biofouling) increase the fragility of the materials and equipment's.
- Absence of direct incentives for aquaculture farmers to return utensils, equipment or general litter collected accidentally at sea.
- Lack of efficient systems, facilities and management for the collection, storage, and processing of used equipment.
- Circular schemes, based on the recycling of end-of-life nets for the production of recycled nets, do not currently appear to be economically viable, since recycled nets are much more expensive than new ones.
- Aquaculture tools and equipment are produced from different types of materials, which makes recycling even more difficult and expensive.



SHELLFISH AQUACULTURE

- Mussel nets, also called socks, can be easily lost at sea, due to weather conditions, or during the harvesting process. Mussel socks are the most numerous aquaculture item found on the sea bottom of the Adriatic Sea (Italy).
- Lack of nets disposal points sometimes lead to inappropriate disposal practices for utensils and equipment.
- Lack of sufficient knowledge about the existence of sustainable alternatives for shellfish aquaculture.
- Directive (EU) 2019/883 on port reception facilities for the delivery of waste from ships refers only to fishing nets as passively fished waste and does not include other equipment and materials, such as small items used in mollusc farming.



SEAWEED AQUACULTURE

- Equipment design is not always adapted to offshore environments or storms.
- Longlines for the cultivation of seaweed are stationed at sea all year round, making them fragile. Adequate alternatives that could withstand the strength of difficult weather conditions throughout the year have not yet been produced.
- The small strings on which the growth of the algae occurs can easily be lost at sea.

3.2. Canary Islands Action Plan

Context

In Canary Islands, the aquaculture sector started to develop in the 1980's in the islands of Gran Canaria and Tenerife and did not spread out to the other islands until 2000. Aquaculture experienced a big increase in recent years and was declared a "**strategic sector**" for the **Regional Government of Canary Islands** (POPESCU, 2013). The Canary Islands have favourable conditions for growing temperate species. Seawater characteristics (yearly constant photoperiod, temperature, and clean oceanic waters), fisheries and market access, infrastructures, and the close relationship between farmers and researchers, helped the sector to grow fast.

Canary Islands are on the third place in finfish production in Spain, after Valencia and Murcia regions. **Seabream and seabass are the most important species produced.** In general, Spain produces about 15% of the European seabream and seabass. Considering the Spanish regions, Canary Islands produce about 28% of Spanish seabream and seabass (Pham, C.K, 2008).

In accordance with the information's gathered through the stakeholder surveys, the most widely used culture system in the Canary Islands is the fattening of fish in floating marine cages. Until July 2016, the authorized species for fattening in the sea were seabream (*Sparus aurata*), seabass (*Dicentrarchus labrax*), and to a less extent tuna (*Thunnus obesus* and *Thunnus albacares*), in Lanzarote Island. Since a few years, different scientific institutions, such as the Spanish Institute of Oceanography –department in the Canary Islands (IEO), have carried out several experimental studies to diversify the species cultured, including both fish and molluscs. Some of these species are the amberjack (*Seriola dumerili*) or the octopus (*Octopus vulgaris*).

The number of cultured species commercially available is continuously increasing (including for example shellfish production). However, the sector faces several challenges, such as conflicts with already existing sectors, for example tourism (Pham, C.K, 2008).

In the Canary Islands, there are already existing legislation targeting the marine litter. For example, the "**Manual for Aquaculture of Good Environmental Practices in the Canary Islands**", specifies the strict ban of abandoned waste generated by the aquaculture activity (plastics, packaging waste, packaging, paper, cardboard, etc.) at sea, which has to be brought ashore for subsequent disposal. The companies must know their waste characteristics and level of danger, separate the waste at source, to facilitate selective collection, and manage waste (treatment, containment, transport, and disposal) in a way that does not cause damage to the environment.

In few words:

- The **most important species produced** in the Canary Islands are the **seabream and seabass**.
- Aquaculture practices are mainly done in **marine cages**.
- The aquaculture sector is expanding with **new experimental species** (including shellfish).
- **Existing legislation targeting marine litter prevention and management are in place**, including best practices for aquaculture on waste management.

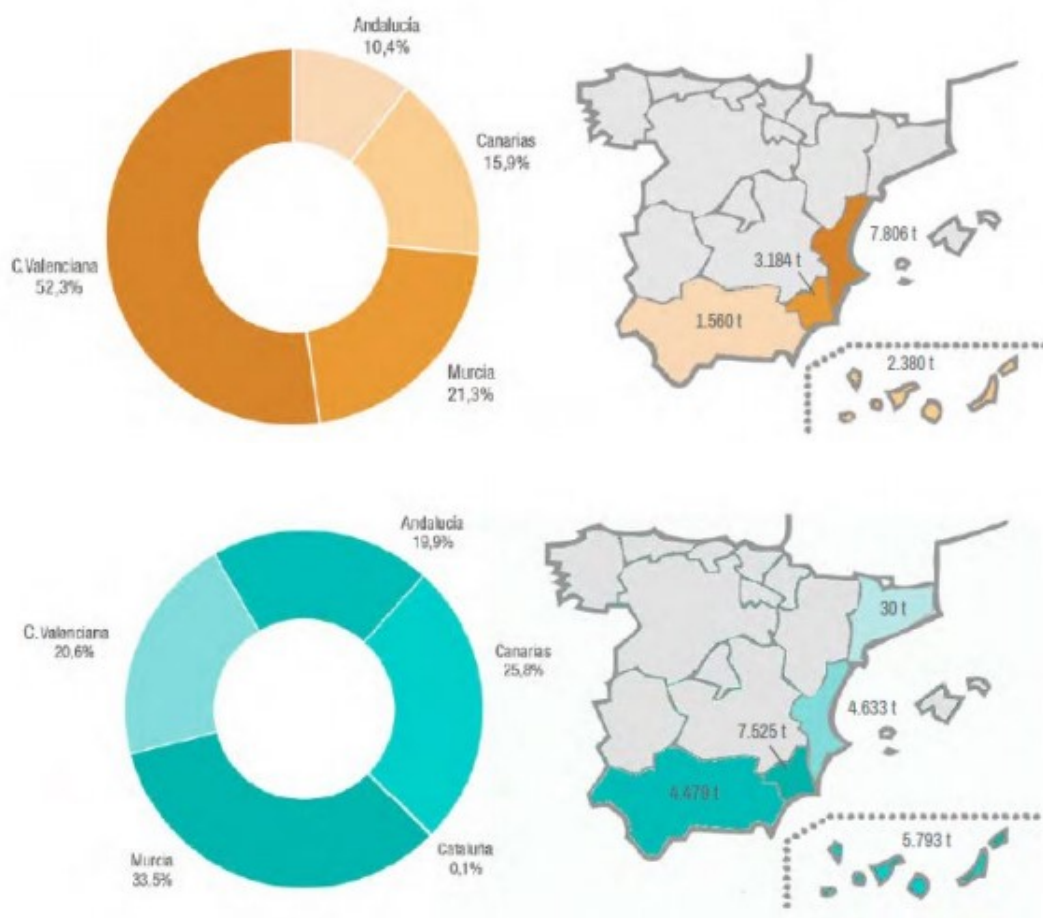


Figure 7— Percentage of seabream and seabass produced in the different regions in Spain.

Good practices

Considering the actual context of Canary Islands and the type of aquaculture production, a list of good practices has been collected and presented as potential measures to be implemented in the already existing strategies in accompanies for **finfish aquaculture**. Measures about **shellfish aquaculture** have been added due to envisioned plan to start cultivation of these type of species. Some measures and solutions are **already applied in Spain Mainland** and were chosen as potential measures and solutions to be implemented also in the Canary Islands.

The measures are presented by type of aquaculture (shellfish, finfish, and seaweed), practice name and description, current implementation place (by sea basin), potential application context specific of the region, and an example of the case current implementation.



❖ **Alternative materials of natural and bio-degradable fibres for mussel larvae collector lines and socks**

Type of aquaculture: Shellfish

Actual Implementation place: North Sea

Description: Mussel larvae collector lines can be made of natural and degradable fibres, such as hemp or coconut ropes.

In France since 2013, the Ministry of Agriculture, Agrifood and Forests made it mandatory to use mussel larvae collector lines that are made of natural and degradable fibres such as hemp or coconut ropes for products labelled as Moules du bouchot (French – traditional specialty guarantee).

In the Netherlands, the use of biodegradable socks for mussel suspension cultures and mussel larvae collector installations as an alternative for cotton socks is a significant improvement to reduce litter that is harmful to the environment if gears are lost or damaged at sea.

Potential application context: Mussels are one of the potential species foreseen in the expansion plan of the aquaculture sector in the Canary Islands. A regulation that would make mandatory the use of bio-degradable collector lines for the new potential farms could prevent any risk of plastic fibres lost at sea.

Examples and/or locations:

- [French regulations,](#)
- [Machinefabriek Bakker from Yerseke, the Netherlands](#)
- [Sustainability award of the shellfish conference foundation](#)



Figure 8— Mussel larva collector (© W.Bakker)

❖ **Introducing new types of mussel production techniques such as Smart Farm system**

Type of aquaculture: Shellfish

Actual Implementation place: Baltic and Mediterranean

Description: Smart Farm or New Zealand system is a production technique based on the use of a cable or a beam anchored to the sea bottom by heavy weights and maintained at a depth of about 3 meters under the sea surface by floats. The mussels are bred on a continuous rope called "watershed", which is fixed to the beam by silhouettes spaced every 8 meters and positioned along the row with a serpentine pattern. They are kept compact on the rope in special water-soluble cotton socks, which melt in seawater after a certain period of time. The type of rope, its diameter and mesh size depends on species that are farmed as well as the natural environment. The mesh gets its buoyancy from PE-Pipe and has bottom weights to keep it vertical in the water column. The mooring has been developed to keep the system in place in sheltered sites, winter iced fjords and open waters with waves up to 7 meters and significant to strong tidal sites with currents up to 4 knots. The system's expected lifetime in the water is 25 years or more.

Potential application context: The Smart Farm system nowadays is used more frequently in North Europe. It enables to cope better with waves and brings a number of advantages in relation to the safety of facilities and personnel, the limitation of product losses, as well as the reduction of environmental impact, as no plastic socks are used, which could detach and settle on the sea bottom. This technique could be eventually introduced in the new potential plan for mussel aquaculture in the region.

Examples and/or locations:

→ [Smart Farm](#)

❖ **Regular maintenance of offshore installations**

Type of aquaculture: Finfish

Actual Implementation place: Baltic and North Sea

Description: The lifespan of aquaculture gear can be improved by dismantling the offshore installations every year and bring them on land for maintenance as soon as the fish have been harvested at the end of the production cycle.

Potential application context: Canary Islands aquaculture sector is mainly composed by marine cages. A good maintenance of installations is crucial for preventing any lost both in terms of biomass and in terms of gears.

Examples and/or locations:

- Every year in a French sea trout aquaculture farm, the offshore installations are dismantled as soon as the fish have been harvested at the end of the season and brought on land for maintenance. They are landed with the help of the current. The cages are made up of walkways and oak bows connected by galvanized steel hinges. Their buoyancy is ensured by polystyrene boxes. The entire system of cages has been internally produced by the farm and, as of now, it has served more than 30 seasons at sea.



Figure 9— Offshore installation plan (© James Allan)

❖ Gear marking and GPS trackers to locate gear

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: Baltic and North Sea

Description: Marking aquaculture gears by colours, tags, and transponders, in order to allow identification if tools get broken or lost is an effective solution to reduce marine litter. Several techniques are available: specially coloured braided ropes, tags, and transponders. These techniques allows for quick identification of damaged gear and therefore speed up its repair. The use of transponders even allows equipment to be spotted from a distance and underwater.

Potential application context: Due to the significant amount of marine fish cages installations in the Canaries waters, marking gears would help to have easier identification of lost gears, and directly track the source.

Examples and/or locations:

- In Canada, the ropes must have identifiers of the region, species being fished and individual fishing area. The requirement is also intended to maintain access to the U.S. seafood market by demonstrating Canada has rules comparable to those in place for fishermen in USA.

➤ [Lost Gear Finder](#) – in response to current Norwegian regulations compelling fishermen to search after lost gear, Furuno Norge AS launched the Lost Gear Finder in 2019. It is a technical system of transponders, transducers and processors that enable fishermen to search for lost gear's position underwater. The technology has been tested with satisfactory results and hopefully it may be replicated in the aquaculture sector.

➤ [MARELITT Baltic](#)– in the framework of the project MARELITT Baltic, new ways of marking have been researched in laboratory and field tests during authentic fishing and aquaculture operations jointly with engineers. The objective was to develop a modern, practical high-tech solution for fishing gear marking, allowing automatic identification, and processing of recorded “in situ” data. The developed solution is a low-cost “smart tag” based on UHF RFID technology. The tag can be used with both new and existing fishing, and aquaculture gear.



Figure 10— Marked Gears (© MARELITT)

❖ Extended life-cycle of nets by their regular maintenance

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: Mediterranean Sea

Description: Regular net maintenance schemes including washing, disinfection, repair and applying anti-fouling treatments, among others, extend the life-cycle of the nets regular maintenance scheme. There are many international companies that produce aquaculture gear, which also provide maintenance services, mainly aquaculture nets, in many areas of the world.

Potential application context: Incentivise collaboration between aquaculture producers and gears production companies in regular maintenances services, could be a good practice for



Figure 11— Nets Maintenance activity (© Guy Dugas)

Canaries aquaculture companies in order to ensure a efficient maintenance of the gears. This practice is already implemented in Catalunya.

Examples and/or locations:

- 📍 Amposta, in Catalunya, Spain

❖ Workshops to raise awareness on marine litter issue

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: North and Baltic Sea

Description: Co-creation of solutions can help the creation of a common effort and enhance cooperation. Organizing awareness workshops with marine litter as one of the topic for a more sustainable aquaculture practice, would bring marine litter experts together with aquaculture sector experts sharing knowledge and co-creating concrete solutions.

Within the framework of the INTERREG project MARELITT Baltic, several workshops were organised aiming at engaging fishermen for sharing their expertise related to, ghost nets hot spots, their knowledge of ship wrecks, and historical fishing effort data. In parallel, the foundations were laid for a change in attitude towards more sensitive topics, such as prevention methods. This approach can be replicated in the aquaculture sector.

ProSea foundation in the Netherlands has been providing marine awareness courses to maritime professionals for the last 20 years. ProSea has developed educational materials for the shipping industry to teach this maritime professionals how to deal with marine debris and organises workshops for professionals from the fisheries and shipping sectors. Similar workshops for the aquaculture sector professionals could help to reduce marine litter.

Potential application context: Several initiatives and campaigns have been carried out in the past years in Canary Islands for increasing awareness about marine litter (e.g. [Aguita con el plastico](#), targeting mainly general society). A new initiative has been launched last year, with a marine litter observatory placed in Fuerteventura, that would monitor marine litter, including fishing nets. Knowing more about the abundance, and the source of marine litter will help in tackling the problem from the source. Including a dedicated aquaculture litter database (see



Figure 12— Awareness workshop (© ProSea)

[AQUA-LIT Marine litter inventory](#)) and organising workshops dedicated to marine litter potentially coming from the aquaculture sector in the area, would help identifying the impact of this sector in the islands, and bring new knowledge and solutions.

Examples and/or locations:

- [MARELITT Baltic](#)
- [ProSea foundation](#)

❖ Specific company requirements preventing accidental losses

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: North and Baltic Sea

Description: By logging in every piece of material that goes into the vessel and logging it out once back on the shore, companies can significantly reduce the quantity of materials lost at sea.

The method used by submarine power cable companies has been very effective in avoiding losses of materials at sea and could be applied to vessels used by the aquaculture and fisheries sector.



Figure 13— Logbook (© Ciacho5)

Potential application context: Having a logbook recording all materials brought and used at sea, would help take track of any materials lost accidentally at sea, especially during operation in offshore aquaculture installations.

Examples and/or locations:

- Baltic Offshore sea cable company



Monitoring and quantification

❖ Compulsory seabed survey

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: Baltic Sea

Description: According to Danish law about waste management and circular design, the aquaculture companies that own fish cages are obliged to survey the seabed in order to assess the amount of litter they produce. The survey is flexible and will be continuously improved to meet the needs to better assess marine litter derived of this specific type of aquaculture.



Figure 14— Monitoring activities (© Enviromet)

Potential application context: Compulsory seabed survey to monitor the potential amount of litter produced should be implemented in all coastal and offshore existing facilities in Canary Islands. A significant amount of litter sinks on the seabed, and therefore a regular monitor and clean of seabed under the aquaculture facility would reduce the potential harm of lost items to biodiversity and the likelihood of producing micro litter.

Examples and/or locations:

- No data available yet. Do you have an example? We invite you to go to our toolbox and add an example under the section [Submit Info](#)

❖ GIS platforms and apps to map marine litter

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: Baltic and North Sea

Description: In France, Ifremer launched a smartphone application *Fish & Click* in the framework of the IndIGO project. It is a citizen science programme in which the general public is asked to take pictures of the fishing gear fragments they have found at sea or on the shore. They mark the type of material, the quantity, take a picture and indicate if any animals have been trapped. The data collected will be used to map the distribution of Abandoned, Lost or

Otherwise Discarded Fishing Gear, to suggest solutions for its management and removal, and to assess the impact on biodiversity. Some of the pictures will be presented in a raising awareness arts exhibition at the end of the project.

The MARELITT Baltic project has started a cooperation with national institutions, such as fishery monitoring centres, and fisheries & aquaculture water management bodies, to obtain their data. Various information was combined to identify zones with the largest amount of lost gear. Geographic Information System (GIS) platforms have been using to ensure the best technological preconditions.

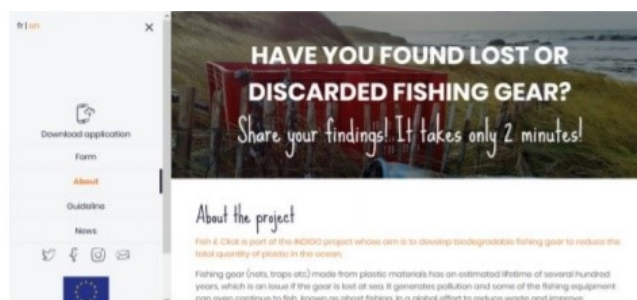


Figure 15— Fish and Click app (© IFREMER)

Potential application context: Engaging society in citizen science initiatives (such as Ifremer [Fish & Click](#) and the [Marine Litter Watch](#)) helps collecting a comprehensive amount of data and increase awareness on marine litter topic. A local marine litter *app* could be developed to be used by the society, but also for those sectors that are potential sources of marine litter in the region, such as tourism, fisheries, and aquaculture sectors. Under the *app* a specific section only for aquaculture related litter (see [AQUA-LIT inventory](#)) should be included.

Examples and/or locations:

- [MARELITT Baltic](#)
- [Ifremer Fish & Click](#)
- [Marine Litter Watch](#)

❖ Acoustic devices such as the Passive Acoustic Transponder (PAT)

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: Baltic Sea

Description: The project MARELITT Baltic will investigate acoustic devices, such as the Passive Acoustic Transponder (PAT). Thanks to its individual identification number, PAT can be read on specific frequencies of ship sonars and 3D-Structure Scans to retrieve the Abandoned, Lost or Otherwise Discarded Fishing Gear (ALDFG) at



Figure 16— Passive Acoustic Transponder (© JW Fishers)

known locations. Depending on the orientation of the net in the water column or the seabed, barium sulphate added to nylon nets increased their acoustic detectability by sonar. Information of the occurrence of lost gear on the surface by high-definition videos, and the overview mapping technologies of underwater obstacles, could provide valuable information guiding to areas where the ALDFG may concentrate.

Potential application context: Passive Acoustic Transponder (PAT) technology can be applied for detecting lost aquaculture and fisheries gears offshore Canaries Islands, being an area exposed to ocean currents.

Examples and/or locations:

➤ [MARELITT Baltic](#)

❖ Round tables to foster cooperation to better manage marine litter

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: Baltic, Mediterranean and North Sea

Description: In Denmark, in relation to the revised circular economy framework, round tables on marine litter have been organised at a municipal level. Their objective was to discuss how to improve monitoring of specific SUP items related to fisheries and aquaculture. Local fishermen, aquaculture farmers and representatives of other offshore sectors were invited to participate.

In Germany, an initiative led by the Federal Environment Ministry, jointly with the Lower Saxony State Ministry for Environment, and the German Environment Agency established a Round Table Against Marine Litter in March 2016. It aimed the development of measures to counteract further pollution of the oceans and to raise the general public awareness of the problem and the need for action. The round table worked along the guidelines of the Marine Strategy Framework Directive (MSFD). The participants developed recommendations for action to combat marine litter, focusing on specific legal frameworks and industry sectors, including aquaculture.



Figure 17— Stakeholders roundtable (© SNC Group)

Potential application context: Marine litter round tables, organised at a municipal level, with policy makers, local fishermen, aquaculture farmers, NGOs, and others to discuss how to improve monitoring of specific SUP items related to fisheries and aquaculture, could be a good solution for engaging all Canaries stakeholders to collaborate in an inclusive common effort for reducing marine litter in both fisheries and aquaculture sector. Apart from improving data sharing, they foster transparency and trust among coastal stakeholders, and aim at reducing costs of long-term monitoring.

For example, one observation made in the last Action Plan report on marine litter for Lanzarote, Canary Islands, A. Ruckstuhl, highlight the lack of current networking and synergies occurring among different initiatives and sectors working on reducing marine litter in the Lanzarote Island. Stakeholders marine litter round table would be a good solution for overcome this challenge and find a common solution.

Examples and/or locations:

- ✦ No data available yet. Do you have an example? We invite you to go to our toolbox and add an example under the section [Submit Info](#)



❖ Fish feed bags alternatives

Aquaculture type: Finfish

Actual Implementation place: North Sea

Description: In Scotland, feed for farmed fish which was originally delivered in small 25 kg bags are now delivered in one-tonne bags and lifted by a crane. Worn and damaged feed bags are taken away by the feed delivery boat and recycled, which reduces accidental loss and waste production.



Figure 18— Big feed bags (© Loch Duart)

Potential application context: Small items, such as feed bags are likely to be accidentally lost while performing activities offshore, due to the wind, lack of care, or wave motion. Replacement of small feed bags by big bags (one-tonne) that can be lifted by a crane has been found a succesfull solution to avoid accidental lost while feeding

the animals. This practice can be considered a good solution also for the numerous marine seabream and seabass aquaculture facilities in the Canary Islands.

Examples and/or locations:

 Scotland, UK

❖ Cooperation of several aquaculture companies to collect marine litter

Aquaculture type: Shellfish, Finfish, and Seaweed

Actual Implementation place: Baltic and North Sea

Description: SeaBOS (Seafood Business for Ocean Stewardship) has assembled 10 top world's largest seafood companies to align their policies of ocean stewardship and seafood standards relating to fishing and aquaculture. Their aim is to make retailers adopt those policies, which consequently would force the entire supply chain to introduce new standards and to have a visible impact on the seafood industry. One of their 6 task forces, works on the topic of reducing ocean plastics to ensure that SeaBOS members map the sources, presence, and type of plastics in their seafood production, as well as identify ways to improve ocean health by removing plastics from the ocean environment. The task force work is based on scientific knowledge, existing best practice, and innovation. The lead companies are Thai Union, Mowi, and Kyokuyo, being the lead scientific institution the Stockholm Resilience Centre. Other SeaBOS members are Maruha Nichiro, Nippon Suisan Kaisha, Dongwon Industries, Cermaq Group of Mitsubishi Corporation, Nutreco's Skretting division, Cargill and Charoen Pokphand Foods.



Figure 19— Mission statement of SeaBOS (© SeaBOS).

Potential application context: A similar Stewardship gathering Canaries aquaculture companies working together with scientists and marine litter experts would help tackling marine litter problem from the source, and amplify the benefits thanks to the implementation of common methodologies and efforts in removing marine litter from the sea.

Examples and/or locations: [SeaBOS](#)

3.3. Policy recommendations

Within AQUA-LIT - Task 5.1, a set of [Policy Recommendations](#) were developed to support policy-making of the marine litter problem in the aquaculture sector. This deliverable was elaborated having in consideration the AQUA-LIT main key findings and results of each of the three sea basins (Mediterranean, Baltic and North Seas), as well as other products and deliverables produced along the project.

These recommendations can be applied to the Portuguese Mainland context, where aquaculture is already developed, and can provide a baseline to the potential new regulation in the Azores, where aquaculture is still an emerging sector.

The key Policy Recommendations can be summarised as follows:

Key Policy Recommendations		
<p>SUPPORT, namely technical, financial and organizational.</p> <p>EDUCATION, TRAINING, COMMUNICATION and COOPERATION.</p> <p>MONITORING losses and litter in the environment with innovative approaches and guidelines.</p> <p>WASTE MANAGEMENT with waste collection points, deposit schemes, incentives, upcycling processes, waste flows.</p> <p>PRECONDITIONS FOR LICENSING.</p>	<p>REGULATIONS through creation and inspections perform.</p> <p>POLICY developing national law and incorporating and implementing policies in national laws.</p> <p>HARMONISATION in licensing procedures and certification systems, of decommission.</p> <p>CERTIFICATION including the standardisation of the labelling systems.</p> <p>Identify the SHARED RESPONSIBILITY.</p> <p>Identify the PRODUCER RESPONSIBILITY.</p>	<p>Identify the FARMER / USER RESPONSIBILITY.</p> <p>Include criteria for CORPORATE SOCIAL RESPONSIBILITY (CSR).</p> <p>MARINE DEBRIS MANAGEMENT through synergies among all the involved stakeholders.</p> <p>DATA QUANTIFICATION on aquaculture debris.</p> <p>RESEARCH and INNOVATION, enhancing knowledge and promoting interdisciplinary and international collaborations.</p> <p>New MATERIALS and new DESIGNS for aquaculture equipment</p>

Figure 20— Summary of Policy Recommendations

4. AQUA-LIT Toolbox

The [AQUA-LIT Toolbox](#) is the result of the compilation of the information provided by the stakeholders in the frame of the project, the state of play regarding the aquaculture marine litter management in 2019 and 2020, and the input of the experts that have been part of/or have worked closely together with the AQUA-LIT team. The Toolbox is supposed to provide guidelines for the management and prevention of the marine litter coming from aquaculture sector in the European context.

The Toolbox target stakeholders from the entire aquaculture value chain including: aquaculture farmers; professional clusters, associations and platform representatives; policy makers; port authorities; aquaculture gear and equipment producers; engineering, system design and construction companies; plastic manufacturers; waste managers; researchers; environmental and social consultancies; NGOs; classification and certification bodies; communicators and any other interested person.

The AQUA-LIT Toolbox is meant to:

- Increase the awareness regarding the harm and the impact of non-organic marine litter associated to the aquaculture sector.
- Involve all the potential stakeholders in the reduction and prevention of marine litter from aquaculture.
- Improve the gear identification during the cleaning-up initiatives.
- Expand potentially applicable good practices and solutions.
- Identify the knowledge gaps that need to be attended to enforce the technical knowledge of the aquaculture farmers, and that need to be filled in by researchers and designers.
- Identify the policy and regulation gaps across Europe that need to be addressed to enforce the litter management practices.
- Facilitate the knowledge exchange among all the involved stakeholders.

Therefore, the AQUA-LIT Toolbox can be considered the most important knowledge repository for aquaculture marine litter related information across Europe, and the starting point for the development of new European policies regarding the marine litter coming from the aquaculture sector.

All stakeholders are invited to discover the [AQUA-LIT Toolbox](#) and find the best measure, funding opportunity, and policy recommendations for their needs, or simply get more knowledge on the aquaculture sector marine litter issue.

5. Conclusions

Barriers and solutions for an efficient marine litter management have been identified on the AQUA-LIT project three sea basins (Mediterranean, Baltic, and North Seas). However, common barriers have been identified across all sea basins, and **several good practices and general recommendations have the potential to also be applied in other sea basins in Europe.**

Transferability processes have been carried out in order to highlight the knowledge and results of the project, and transfer them to stakeholders from other European regions, focussing on **Azores, Portugal mainland and Canary Islands.**

In the Canary Islands the aquaculture sector is already well-developed. Policy recommendations and possible measures for prevention, monitoring and reduction of marine litter from the aquaculture sector are important for a **better and more efficient management of marine litter** in this region, on top of the already existing legislations or measures in aquaculture companies.

However, **more research should be done to assess feasibility and potential efficiency of implementation of practices and solutions** considered applicable in these above-mentioned regions, together with a step-by-step study of the actual methodology for implementation of each practice proposed.

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