

AQUACULTURE MARINE LITTER MANAGEMENT



AQUA-LIT



ACTION PLAN

**PORTUGAL
MAINLAND AND
THE AZORES**



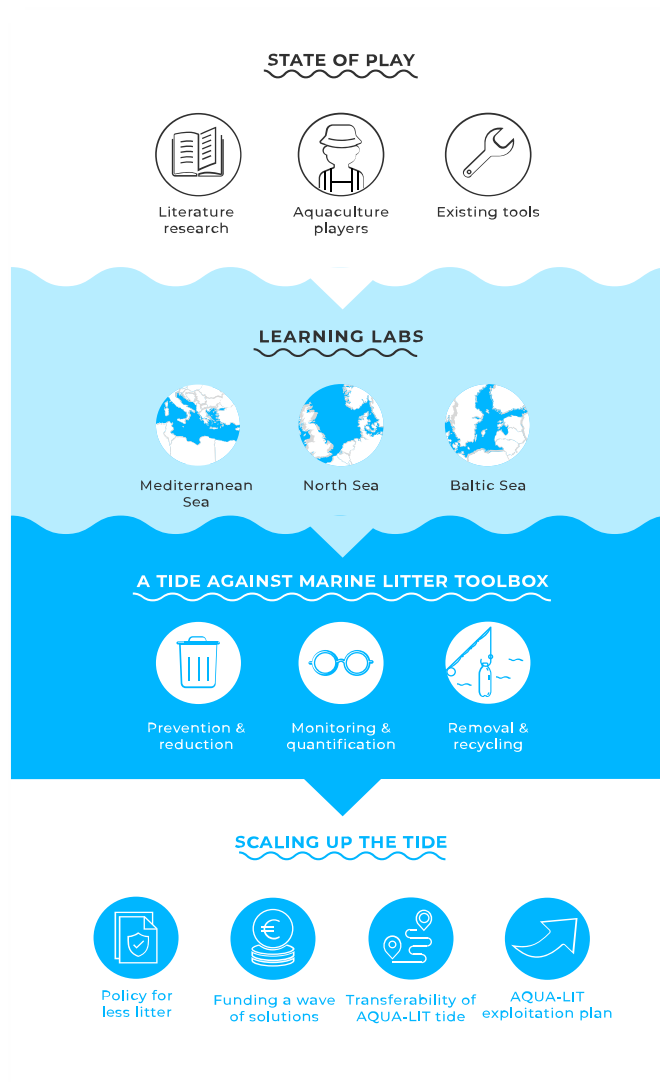
AQUA-LIT project

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 Azores Islands and Mainland Portugal. The aquaculture sector in Portugal Mainland is in rapid expansion, whereas in the Azores Islands this sector is considered as an emerging one within the Blue Growth strategy. For these reasons, **the current action plan considers both different contexts** and gathers solutions, measures, and policy recommendations that could potentially be applied also to these regions contexts. **Webinars with previously identified stakeholders have been carried out in the local language (Portuguese),** 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 Azores and Portugal Mainland 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 Portugal Mainland and the Azores. If interested in the Action Plan for the Canary Islands, then it can be consulted at:

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

Region		Reason	Aim
Azores		Aquaculture in the Azores is an emerging sector , considered potentially important for the development of the Blue Growth in the region.	Transfer policy recommendations and possible ideas and solutions for the prevention, monitoring, and reduction of marine litter from the aquaculture sector before it expands.
Portugal Mainland		Aquaculture in Portugal Mainland is growing , and new techniques , such as offshore aquaculture, and new species are being planned and tested.	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 those regions - Azores, and Portugal Mainland, 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 Plans targeted to Portugal Mainland and Azores 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.

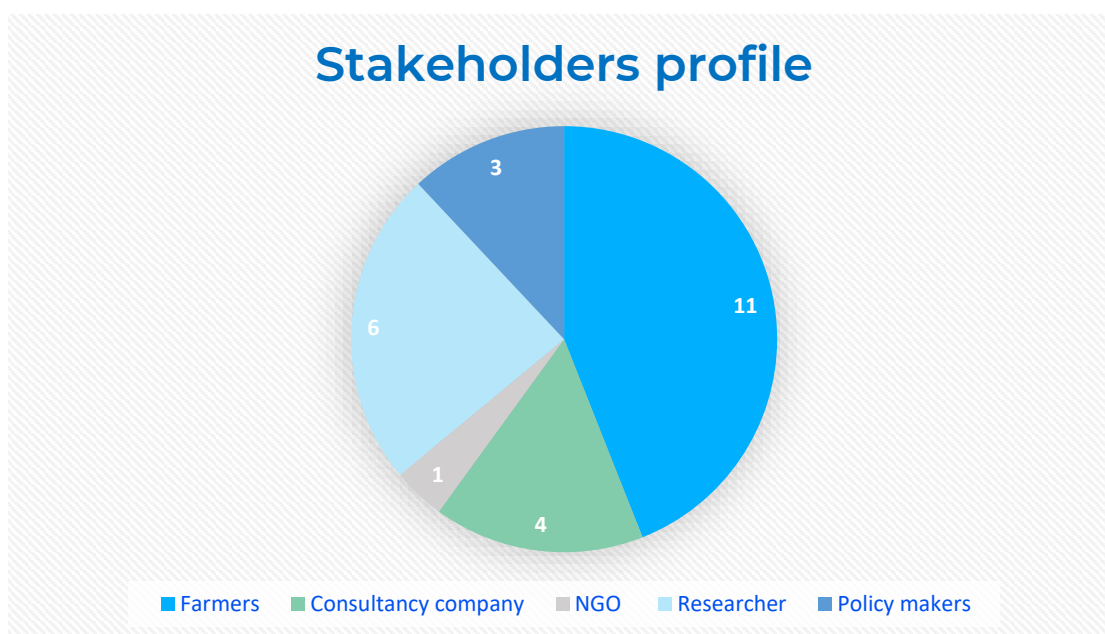


Figure 2— Identified stakeholders' profile.

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 Azores, and mainland Portugal. In order to complement the literature review, a short survey was sent while contacting the identified stakeholders for the first time.



Survey targeting Azorean and Mainland Portuguese stakeholders:

1. Em que tipo de estabelecimento de aquicultura trabalha? (Espécies produzidas e técnica utilizada)
2. De que tamanho é o seu estabelecimento (pequeno, médio ou grande)?
3. Tem um sistema de monitorização de resíduos não-orgânico no seu estabelecimento?
4. Envia os resíduos não-orgânicos para uma central de reciclagem?
5. A sua empresa tem alguma certificação ambiental?
6. Que legislatura está atualmente em vigor relativamente à gestão de resíduos no sector de aquicultura na sua região?
7. Que tipo de avaliações de impacto ambiental são atualmente impostas para o sector de aquicultura na sua região?

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 **Portuguese** 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.

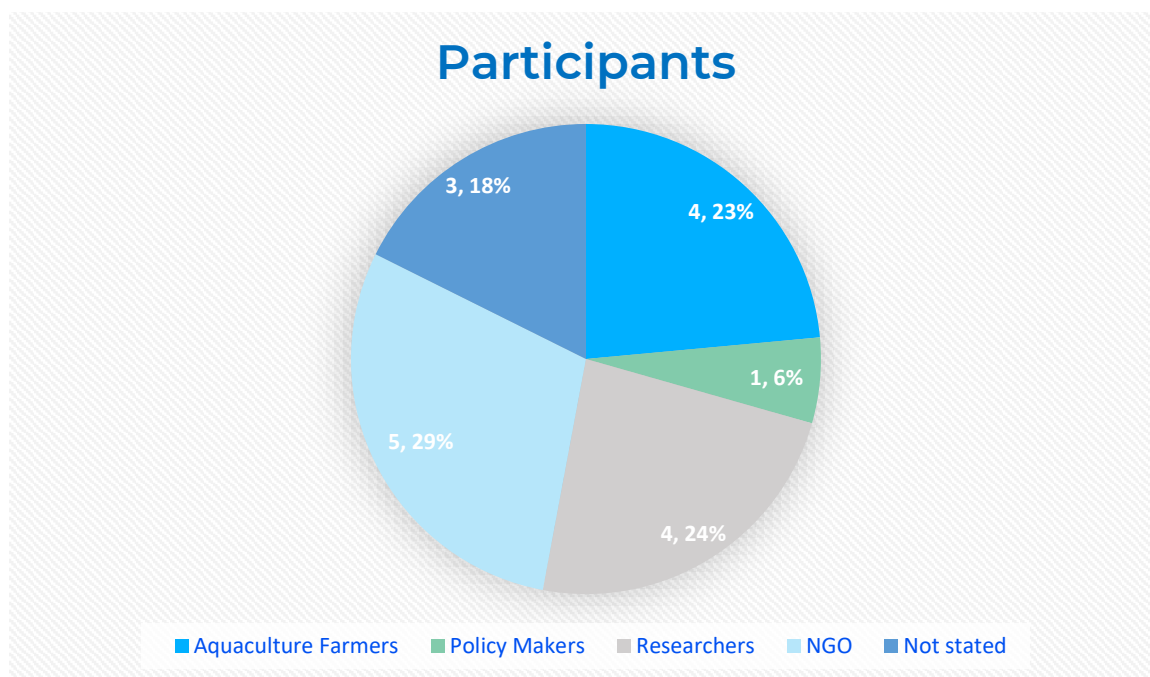


Figure 4— Number and type of webinar participants.



Figure 5— Promotion flyer of the Portuguese transferability webinar

Webinar accessible here: <https://www.youtube.com/watch?v=RWRyKtJfW8A&t=1s>

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 Azores and Portugal Mainland. 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 Azores, and Portugal Mainland.

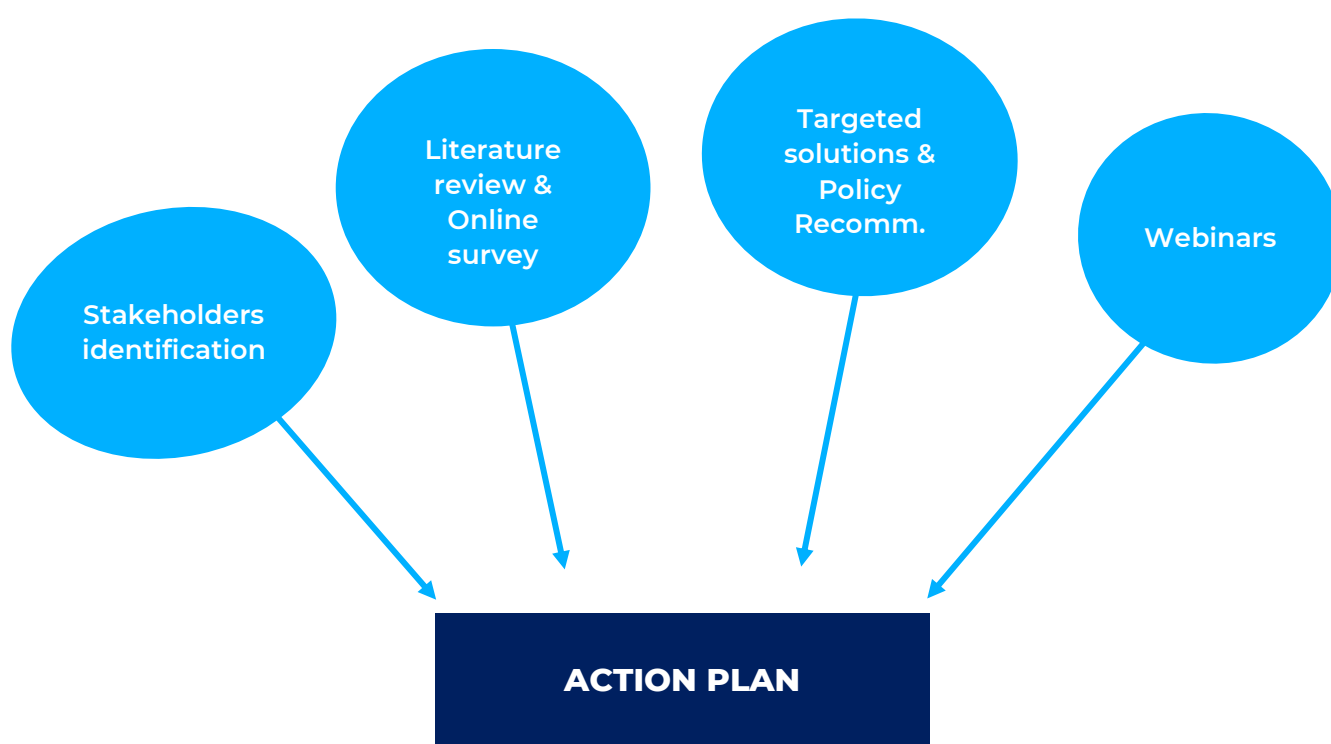


Figure 6— Process for creating the Action Plan

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 Portugal Mainland and Azores. 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 in the two regions, and therefore interesting to take into consideration also for the two contexts (Portugal Mainland & Azores)**. 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. Portugal Mainland and Azores Action Plan

In this section, the action plan for Portugal Mainland and Azores is presented, taking into consideration the current situation of the aquaculture sector in the two regions. The action plan consists of selected measures and solutions for a better prevention, monitoring and removal of marine litter from the aquaculture sector taken from AQUA-LIT results and adapted to the context of the regions, followed by the general policy recommendations also developed in the project.

Context

Aquaculture in Portugal is a growing sector. [The Portuguese National Strategy for the Sea \(2013-2020\)](#) identifies aquaculture as one of five strategic areas for intervention to achieve "blue growth".

The [Strategic Plan for Portuguese Aquaculture \(2014-2020\)](#) provides a number of targets for this sector, with the expectation of an **increase of 25,000 tonnes in the national production capacity by 2023**, with the support of the European Maritime and Fisheries Fund (EMFF). (Apambiente.pt, 2017)

The Portuguese aquaculture production consists mainly of marine fish and shellfish, which are reared mostly in brackish systems, such as estuaries and coastal lagoons, along the country's mainland coastline; aquaculture in the Portuguese archipelagos is poorly developed and only Madeira presents aquaculture production (Rocha, 2017).

The aims of the Action plan are the:

- Implementation AQUA-LIT Toolbox measures and recommendations into existing marine litter management and prevention measures in the companies, and at the political level.
- Inclusion of specific measures for offshore aquaculture to take into consideration for future plans of expansion of offshore aquaculture especially in Portugal Mainland.
- In the case of Azores, as the region is investing in this sector, it will be an asset to take these recommendations into account before the sector expansion.



Portugal (Mainland & Autonomous regions)

Bivalves represent 45% of the total aquaculture production in Portugal. The most produced species is the clam (*Ruditapes decussatus*), representing about 50% of the total molluscs' production, followed by mussels (*Mytilus edulis*), the Portuguese oyster, and the Pacific cupped oyster (*Magallana gigas*). **The tanks for fish production corresponded to 9.5% and floating structures (predominantly used for the production of bivalve molluscs) to 2.3% of the total licensed establishments.** The production of molluscs in Portugal is mainly carried out in extensive systems, although mollusc production in semi-intensive systems exists as well, mainly for oysters

(Rocha, 2017). In 2017 Clams counted for 32.8% of the total production of marine and brackish species, followed by the turbot (23.2%), mussels (14.5%), oysters (10%), sea bream (8.8%), sea bass (5.9%), cockle (2.4%) and sole (1.3%) (Rea.Ambiente.pt, 2017).

Production by species

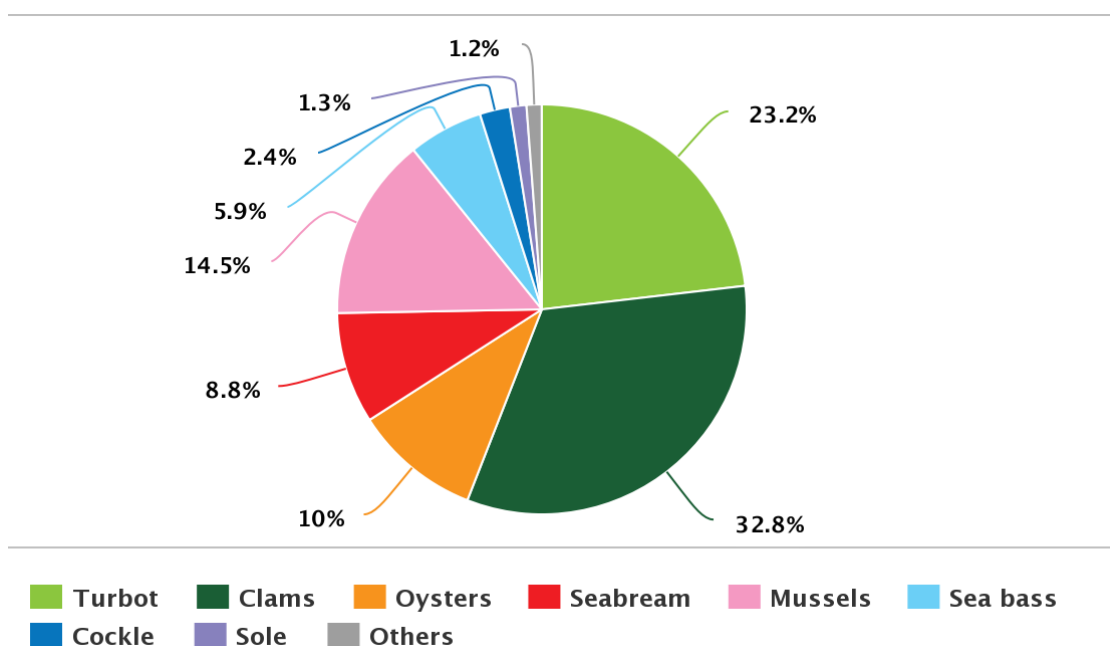


Figure 7— Percentage of production by species

Although offshore farms are beginning to be implemented, there are still very few establishments operating, and the production from these facilities is yet notably low comparing to the production in brackish waters. **There are currently 20 fluctuant facilities operating offshore**, all in the South of Portugal Mainland (DGRM, 2015). A new pilot aquaculture plan for offshore salmon production is located about 11 nautical miles outside the town of Ílhavo in the district of Aveiro, on the North West coast of Portugal Mainland. An offshore fattening clam's installation has been lately started in Portimão region (APA - Associação Portuguesa de Aquacultores, webinar reference). **According to the Strategic Plan for Portuguese Aquaculture (2014-2020), the growth rate of this sector is limited by the technical and natural conditions, the available spaces of cultivation, and the availability of financing** (Rea.Ambiente.pt).

Regarding the marine litter, according to the Apambiente Report of Marine Litter (Apambiente.pt, 2017), part of the items found on the Portuguese Mainland monitored beaches which are considered sourced by fisheries and aquaculture are: Fishing boxes, jerry cans, professional and rubber gloves, floats and buoys, nets and pieces of net <50 cm and > 50

cm, tangle of nets and cords, rumps for octopuses, luminous tubes, cables and ropes > 1cm and < 1cm, sinkers, traps / nets / trays / bands for oysters, mussels, crabs, lobsters. This report presents the information collected in the 39 campaigns carried out in 2017 in 11 monitored beaches in Portugal Mainland (Programa de Monitorização do Lixo Marinho em praias, Apambiente.pt, 2017).

According to the results obtained in 2017, for an area of 100m, more than 65% of reported litter it is not possible to assign a source. Of the trash classified, the most significant sources were the following: fishing and aquaculture (11%), tourism and recreational activities (10%), and sanitation (6%) (Programa de Monitorização do Lixo Marinho em praias, Apambiente.pt, 2017) (Figure 8).

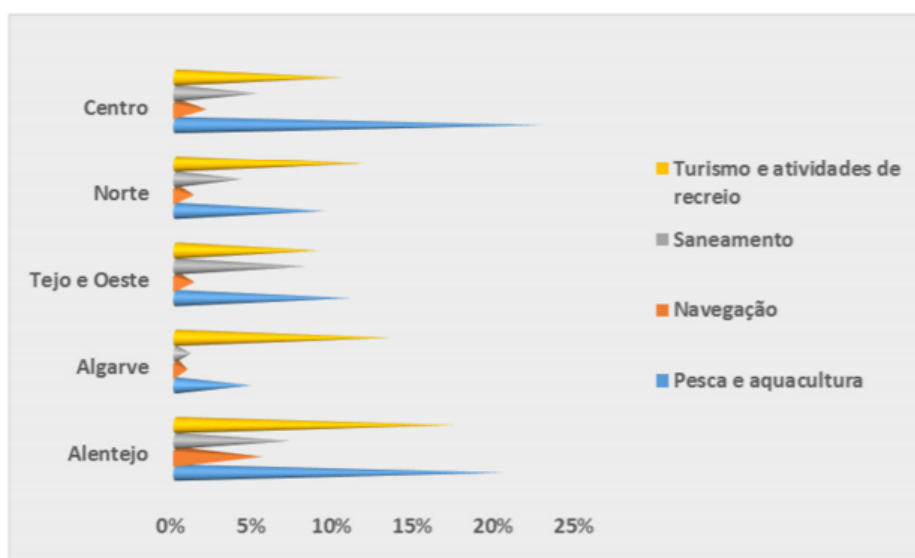


Figure 8— Distribution of indicators of origin by Regions.

(Source: Programa de Monitorização do Lixo Marinho em praias - Apambiente.pt, 2017)

In accordance with Apambiente report, the percentage of marine litter in the beaches depends on the location monitored. While in Alentejo and in Central Region, fishing and aquaculture are the most relevant source of marine litter; in Algarve and in the North Region, tourism and the recreational activities have the greatest expression in what concerns the marine litter. In the Tagus and West Region, fishing and aquaculture are the most representative source (11%) of marine litter, but tourism and recreational activities (9%), and sanitation (8%) are also noteworthy (Programa de Monitorização do Lixo Marinho em praias, Apambiente.pt, 2017).

In a few words:

- Most species produced in the Portuguese aquacultures are from marine origin.
- Weather conditions can sometime be rough.

- Aquaculture is mainly extensive and semi-intensive.
- Offshore aquaculture is under development with some existing facilities in the South of the country and in the North of Portugal mainland.
- There is evidence from beaches monitoring programmes that a percentage of marine litter found comes from fisheries and aquaculture sector.



Azores

Located in the middle of the Atlantic Ocean, **in the Azores the limiting factors for aquaculture development** are several. These include **geographic isolation, rough weather conditions, and great depth**. The coastline presents high and steep cliffs, making this zone difficult to access. Sheltered bays are rare and the shore environment is typically exposed to strong wave action, which makes it difficult to safely install and manage especially coastal and offshore aquacultures. However, seawater temperature might be regarded as favourable to mariculture activities, as well as the clean oceanic seawater with low pollution levels (Pham, 2008). **Currently, there are two freshwater aquaculture stations for the production of rainbow trout**, one in São Miguel Island and the other in Flores Island.

Discussions about the requirements and assets to promote the development of offshore aquaculture in the region started in the 1980's. The perception was that the environmental conditions in the archipelago would demand important investments in advanced technology and scientific knowledge, for an activity that involves a considerable amount of risk. **An increase in aquaculture production is expected to occur in the following years, both offshore and in tanks inshore**, as a number of initiatives from the Regional Government have taken place in recent years to ensure the necessary conditions for aquaculture development, with the private sector showing interest in investing (Silva, A et al. 2019).

On São Jorge Island, historically clams have been exploited in an extensive way, but a plan to produce them extensively is now under development. Currently, there is an aquaculture company - [AQUAZOR](#) in São Miguel Island, which is running pilot project in Ribeira Quente, which through a floating cage installation is growing *Seriola sp.* The same company AQUAZOR also has a pilot [project](#) of seaweed aquaculture production which currently is under development and intends to cultivate seaweed at a major scale in the sea.

Currently, there are three defined areas for the development of the aquaculture sector, established by the Government Council Resolution no. 126/2016, of 25 July, altered by Government Council Resolution 2/2018, of 24 January.

In the past years the Azores Government has been monitoring marine litter following the MSFD directive. Since 2015, 172 campaigns (coastal and underwater) have been carried out, many of them included in the annual campaign of the Regional Government, “Azores Entre-Mares”, where it was possible to collect more than 30 tons of garbage. In these monitoring, the garbage was divided into 4 categories: plastic, glass, metal and undifferentiated (paper, wood, etc.). Plastic is undoubtedly the predominant material (Figure 9), with an abundance of 47% (Estratégia Marinha, Relatório do 2º ciclo, Governo dos Açores, 2020).

Percentage of garbage types found in cleaning-up campaigns

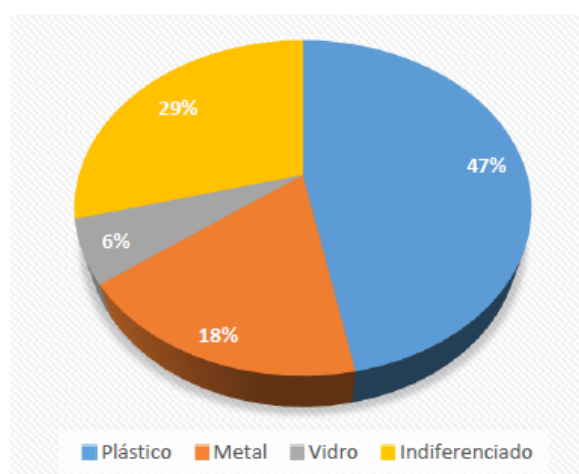


Figure 9— Abundance of garbage found in cleaning campaigns, in percentage (%), per category (plastic, metal, glass and undifferentiated), between 2015 and 2018 (Source: Estratégia Marinha, Governo dos Açores, 2020).

In a few words:

- ✦ Weather conditions are difficult and unpredictable.
- ✦ Aquaculture production is expected to increase in the coming years, both offshore and in coastal tanks. In recent years, the Azores Regional Government has taken several initiatives to ensure the necessary conditions for the development of aquaculture in the region.
- ✦ There is currently a pilot aquaculture project of *Seriola sp.* with a cage installation in São Miguel, and a pilot project for seaweed aquaculture is currently under development while plans for other species are being discussed.

- Data taken from coastal and underwater surveys carried between 2015 and 2018 showed that plastic represents the most found material in the Azores.

Good practices

Considering the actual context of Portugal Mainland and Azores, and the type of aquaculture production, a list of good practices has been collected and presented as **potential measures to be implemented into the already existing waste and marine litter management strategies in the aquaculture companies and at the political level. In the Azores case, these measures can be taken into consideration before the sector grows.**

Considering the summarised context points for Portugal Mainland and Azores, we gathered the measures and solutions specific for rough weather, targeting finfish, shellfish, and seaweed aquaculture. Other solutions, such as cooperation ideas, recycling schemes, and monitoring practices that are potentially applicable to the Azorean and Portuguese mainland context are also included in the Action plan.

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.



❖ Natural and bio-degradable fibres for mussel larvae collector lines and socks

Type of aquaculture: Shellfish

Actual Implementation place: North Sea

Practice 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 mandatory the use of mussel larvae collector lines that are made of natural and degradable fibers, 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 the second main product in Portugal Mainland, therefore a shift to biodegradable tools would avoid the use of substantial amount of nylon nets, that could be potentially lost in the sea.

Examples and/or locations:

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



Figure 10— Mussel larva collector (© W.Bakker)

❖ Return and reuse of net bags and sacks used for product transportation

Type of aquaculture: Shellfish

Actual Implementation place: Mediterranean Sea

Practice description: Net bags and sacks used for products transportation from an aquaculture farm to the final consumer or to the processing company are usually in good state, as they are only used once. Therefore, in case of direct marketing, farmers can request their clients to return those items back, once mussels have been removed and, thus, reuse them with no extra cost. This is currently done by the Menorcan mussel farmer Muscleres González and the mussel farmers associated to a Spanish Protected Designation of Origin (PDO) organization.



Figure 11— Net bag for transporting shellfish (© Paco González)

Potential application context: The main production in Portugal Mainland consists in shellfish (clams and mussels). The implementation of this simple and good practice could help decreasing the amount of waste (net bags and sacks), bringing also a potential economic benefits due to the reuse of bags and less waste produced.

Examples and/or locations:

- Menorcan mussel farmer [Muscleres González](#) and the mussel farmers associated to a Spanish PDO organization.

❖ Flexible permits adapted to local conditions

Type of aquaculture: Shellfish

Actual Implementation place: Baltic and North Sea

Practice description: Mussel larvae collector lines in the Netherlands, Denmark and Germany do not have the permit to remain at sea all year round, a solution to prevent potential loss. Instead they are allowed to stay at sea from 1st March to 1st November and have to be taken out of the water every winter because of the storm season and the potential loss this generates. This is already settled during the licensing process.

Potential application context: Having permits to place collector lines only during some months with less storm probability could help reducing and preventing potential loss not only of

biomass but also of lines for shellfish production. This could be helpful in stormy areas in Portugal Mainland and especially in the Azores, where weather conditions are a potential barrier for coastal and offshore aquaculture practices.

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](#)

❖ Incentivise Sustainable Certifications and labels

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: North and Mediterranean Sea

Description: There are many certification bodies accredited to do aquaculture audits and certification worldwide. The accreditation system is based on ISO17065. The main role of the certification bodies is to ensure that the aquaculture companies are complying with specific criteria that include multiple aspects related to fish farming: environmental criteria, ecological production, animal welfare, among others. Criteria for waste prevention and management are included in the aquaculture standards. In some cases, the criteria include using gear which is certified according to national legislation. The Aquaculture Stewardship Council (ASC), an independent international non-profit organisation manages a certification and labelling programme for responsible aquaculture worldwide. ASC has been working on measures to reduce marine pollution by plastic and the standard to encourage responsible use of plastics in aquaculture. A white paper *Marine Litter and Aquaculture Gear* that addresses this topic was published in November 2019.

In addition to the international standards, there are specific national guidelines provided by certification bodies in Spain and national regulations in France.

In terms of installations, French operators of marine aquaculture facilities, except shellfish farms, with a producing capacity over 5 tonnes of fish per year, must comply with the regulations of [Classified Installation/Facility for the Protection of the Environment defined by French national decrees](#). They must request an [authorisation before putting their farm into service and prove that the farm and operations meet the technical measures for prevention of environmental risks and nuisances defined in general prescriptions and regulations](#).

Potential application context: Incentivise certifications schemes and labels that include marine litter and waste management in the criteria and supporting financially also small companies in receiving accreditation, would help increasing sustainable practices and behaviour in the country, and make all products more competitive in the market.

Examples and/or locations:

- ✦ [Spanish Ministry of Agriculture](#)
- ✦ Agence Française pour le Développement et la Promotion de l'Agriculture Biologique, Regulations of [Classified Installation/Facility for the Protection of the Environment](#) (ICPE - Installation Classée pour la Protection de l'Environnement), France.

❖ 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, transponders, etc. These techniques allow quick identification of damaged gear and therefore speed up its repair. The use of transponders even allows equipment to be spotted from distance and underwater.



© MARELITT

Potential application context: In Portugal Mainland offshore aquaculture is in expansion. Marking aquaculture gears could be a good practice for this type of aquaculture in regions with stormy weather as the Atlantic Coast of Portugal Mainland. This practice should be also implemented in the potential new coastal and offshore aquaculture plans in the Azores.

Figure 12— Marked Gears (© MARELITT)

Examples and/or locations:

- ✦ Canadian and Danish regulations.
- ✦ 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](#) – 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.

❖ Nets Extended life cycle by 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.



Figure 13—Nets Maintenance activity (© Guy

Potential application context: Incentivise collaboration between aquaculture producers and gears production companies in regular maintenances services could be a good practice in Portugal Mainland and in the Azores where stormy conditions could speed up the process of gears deterioration.

Examples and/or locations:

- Amposta, in Catalunya, Spain

❖ Technical studies to determine storm proof character of installation

Type of aquaculture: Seaweed

Actual Implementation place: North and Baltic Sea

Description: In the Netherlands as well as in the Danish, Finish and German licensing processes, a technical study is mandatory to receive a permit for the installation of an offshore seaweed

farm. This technical study must demonstrate that the installation is storm proof. Although there is never 100% certainty, this is likely to reduce the risk of damage to the installation.

Potential application context: Seaweed is one of the potential production for the growing aquaculture sector in the Azores. Being the region affected by numerous storms, a compulsory technical study and trial to receive permit for an offshore seaweed installation should be included in the licensing processes.

Examples and/or locations:

- 📌 Danish, Dutch, Finish and German regulations

❖ **Efficient warning and communication systems about the location of offshore installations**

Type of aquaculture: Seaweed

Actual Implementation place: North Sea

Description: The Dutch Noordzeeboerderij foundation implements preventive measures to make the sea farm pilots visible on sea maps and prevent their damage by ships sailing through the installations. They position measurement buoys equipped with AIS, big cardinal buoys, which when ships sail too close to the seaweed farm warn them.

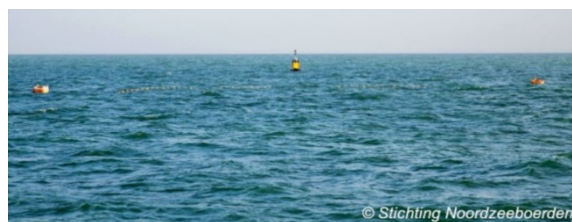


Figure14— AIS system in the North Sea (© Noordzeeboerderij foundation)

Potential application context: Installing buoys equipped with Automatic Identification System (AIS) that warns ships that sail too close to the seaweed farm could be applied also in other type of intallations, such as clams farm in the South of Portuguese coasts, where spatial conflicts with tourism boating sector sometimes occurs.

Examples and/or locations:

- 📌 [Noordzeeboerdeij foundation](#)



❖ Aerial monitoring

Type of aquaculture: Shellfish

Actual Implementation place: North and Baltic Sea

Description: Aerial monitoring could be a valuable alternative or complementary to monitoring by ships. From the air, certain aspects are easier to monitor than from a ship, such as e.g., the detection of cables coming loose, or the observation of an exceptionally fast growth rate of cultivated organisms. In the Netherlands, this system has already resulted in the detection of a large biomass of mussel growth, which was communicated to the mussel farmer and enabled him to harvest earlier than he originally planned.

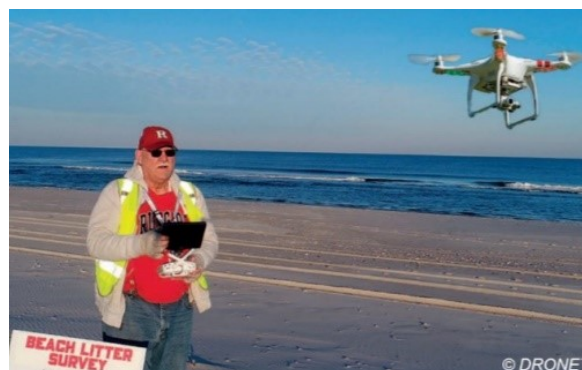


Figure 15— Aerial monitoring with drones (© DRONET)

As an example, the DRONET is an international organisation founded to develop open source protocols and tools for marine surveys. Members contribute by sharing images they have captured with drone cameras during beach surveys to develop, test and improve algorithms and survey methodologies. Each member must first agree on the Marine Litter DRONET Charter, which ensures there is a common understanding of the open and collaborative nature of the network. Members on the network exchange survey findings and experiment with new approaches. They discuss their surveying approaches with other members and join a coordination forum for all members four times a year. The Baltic Sea members, such as e.g., the municipality of the Southern Swedish Islands, discuss the possibility to use this method in selective monitoring of marine litter derived from fishing and aquaculture activities. They want to use the collected data for developing a programme of measures (PoM) as part of the adoption and implementation of the Marine Strategy Framework Directive (MSFD).

Potential application context: Shellfish are the most produced aquaculture species in Portugal Mainland. Regular aerial monitoring can be a good practice in the big clams farms located in South of Portugal to check biomass growing, gears state monitoring and visible marine litter.

Examples and/or locations:

➡ [DRONET](#)

❖ Compulsory seabed survey

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: Baltic Sea

Description: According to the Danish law on 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 16— 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 Portugal Mainland, while should be included as a licensing criteria in the potential new facilities in the Azores. A significant amount of litter sink on the seabed, 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.](#)

❖ 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 Portuguese stakeholders in order 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. They also aim at reducing costs of long-term monitoring.

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](#).

❖ Incentives for monitoring and reporting schemes compliance

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: Baltic Sea

Description: The core of this good practice could be a voluntary “responsible aquaculture scheme” that interest farmers to commit themselves, establishing a principle by which responsible aquaculture farmers will be rewarded. This schemes would expect compliance to a set of requirements (e.g., improved gear marking, better cooperation with control bodies, improved monitoring and reporting of gear loss, etc.) and in return the market could offer these aquaculture companies or family farms

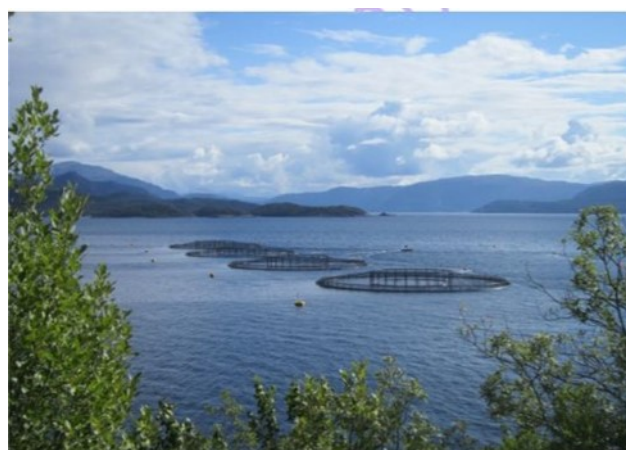


Figure 18— Aquaculture facility (© Brataffe CC BY SA 4.0/Wikimedia)

economic rewards, such as promoting their “littering – free aquaculture” and paying a higher price for their products.

In the framework of the LEADER project that promotes locally-caught fish, at a local/regional level in the Skane county in Sweden, there are plans to include “ghost fishing-free” criterion for consumers to choose more environmentally-friendly produced fish. This idea could be adapted to the aquaculture sector as well.

Potential application context: Incentivising farmers to monitor and follow reporting schemes compliance by offering an economic reward and better image as “littering – free aquaculture” could help both small and big aquaculture Portuguese companies to monitor better their practices and competing in the market of “more conscious” consumers.

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.](#)



Removal and recycling

❖ Cooperation with local NGOs to collect marine litter

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: North Sea

Description: In some regions in France, after a storm, local NGOs (e.g. CAP 2000 in Brittany, Windsurf in Normandy, and Surfrider in Southern Brittany) in cooperation with regional shellfish committees organise beach cleaning activities to assist aquaculture farmers in locating and collecting their lost equipment.



Figure 19— Beach clean-up activity (© Wikimedia)

Potential application context: Portugal Mainland and especially Azores are subject to frequent storms. In Portugal, there is more than [100 associations](#) committed to reduce marine litter by improving awareness among citizens and policy makers, and by carrying clean up activities in beaches or river beds. Fishermen and farmers cooperation with those associations in clean up activities after strong storms, could be a good solution for join efforts in reducing marine litter but also in sharing social responsibilities.

Examples and/or locations:

- [CAP 2000](#)
- Windsurf in Normandy, France
- Surfrider in Southern Brittany, France

❖ Feasible EPR schemes based on Circular Economy and 5Rs approach

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: Mediterranean Sea

Description: Introducing Extended Producer Responsibility criteria to gears and plastic tools producers, and improve Circular Economy and 5Rs approach (Refuse, Reduce, Reuse, Repurpose, Recycle), could help sharing the effort and cost for aquaculture waste management and could help find new valuable solutions under Circular Economy criteria.

In Italy, all plastic packaging producers have to pay a tax. They are members of a consortium (CONAI) that manages their taxes, being these used for the packaging disposal process. A similar idea is pursued by the European consortium of companies and associations representing the entire value chain of flexible packaging (CEFLEX.EU). The CEFLEX mission is to further enhance the performance of flexible packaging in the circular economy by designing and advancing better system solutions identified through the collaboration of companies representing the entire value chain.



Figure 20— CEFLEX Annual Report

Potential application context: In Portugal, [APIP](#) is an organisation that promotes and support the plastics industry through actions that can contribute to its development and technical, economic and social progress, in conciliation with the preservation of the environment. Fisheries and aquaculture gears producers could be part of this or similar organisations that support partnership and common effort in finding valuable solutions.

Examples and/or locations:

- [CONAI](#)
- [CEFLEX](#)
- [APIP](#)

❖ Environmentally friendly boxes for transporting products

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: Baltic and North Sea

Description: Traditionally, even today, the fish industry uses transport materials made of polystyrene, which have been used for intercooling for many years. By switching to Forest Stewardship Council approved cardboard boxes or to environmentally friendly reusable boxes, producers can significantly reduce their plastic consumption. The use of plastic can also be reduced by improving the design of Modified Atmosphere Packaging trays.



Figure 21— FSC Cardboard (© FSC)

Mowi company switched from using polystyrene boxes to Forest Stewardship Council approved cardboard boxes instead, which has further reduced their plastics use by 7 tonnes per year. Since 2015, Mowi processing plant in Bruges, Belgium, has reduced the weight of Modified Atmosphere Packaging (MAP) trays by 20%, which in turn has reduced plastic consumption by 96 tonnes per year.

Nordshell, a Danish shellfish processing plant has switched from using polystyrene boxes to Forest Stewardship Council approved cardboard boxes instead, which has further reduced their plastics use by 9 tonnes per year.

Potential application context: As mentioned in the monitoring report of marine litter in beaches of Portugal Mainland (Programa de Monitorização do Lixo Marinho em praias, Apambiente.pt, 2017), polystyrene boxes used mainly by fishermen, were found in a significant amount stranded on the Portugal beaches. Switching to FSC approved cardboard boxes would avoid the potential lost of those items from coastal and offshore farms, while also reducing the waste management cost.

Examples and/or locations:

- [Deutsche See](#)
- [Mowi processing plant in Bruges](#)

❖ Fishing for Litter Schemes applied to aquaculture sector

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: Baltic, North and Mediterranean Sea

Description: *Fishing for Litter* is an initiative recommended by OSPAR to stimulate fishermen to keep the fished litter on their vessels and to bring it to the shore with the aim to monitor the types of litter that are being found. Applying Fishing for Litter Schemes also to aquaculture sector would incentivise farmers to bring the litter found accidentally in the sea to the ports, without having to pay any tax.

The project that aims to eliminate pollution in the Northern Seas was developed by KIMO (Local Authorities International Environmental Organisation), an association of coastal local authorities. The Belgian Marine Environment service supports the VVC Equipment foundation of the Flemish fishermen to take part in the *Fishing for Litter* initiative.



Figure 22— Fishing for Litter scheme
(© OSPAR)

In Shetland Islands, Scotland, the Shetland Amenity Trust manages the operations of the *Fishing For Litter* scheme. The German NABU supports the collection, sorting and monitoring of waste in many Baltic Sea ports, and fosters the involvement of fishermen in the initiative. So far, aquaculture farmers are not part of the project.

In Italy, *Salva Mare* is a fishing for litter scheme under approval and final consultation. The Directive *Salva Mare*, which was recently approved by the Italian chamber being currently under final consultation, allows fishermen to collect any type of plastic and nets found at sea, and to bring them to special collection sites. If approved, this directive will encourage fisherman, and eventually seafood farmers, to collect waste encountered while fishing, including mussel nets and other aquaculture dispersed items.

Potential application context: In Portugal Mainland, a Fishing for Litter programme has been implemented by Docapesca, called “[A pesca por um mar Sem Lixo](#)”. In the Azores, within the framework of [LIFE IP AZORES NATURA](#), in 2020 a fishing for litter scheme has been implemented in areas selected by fishermen collaborating with the project consortium. Extending this scheme also to the aquaculture sector could enhance cooperation between the two sectors and join forces to clean the ocean.

Examples and/or locations:

- ✦ [Ospar - Overview and assessment of implementation reports Fishing for Litter](#)
- ✦ [Shetland Amenity Trust](#)
- ✦ [NABU](#)
- ✦ [Net-Works](#) - The Net-Works project is a collaboration between global carpet tile manufacturer Interface Inc., the Zoological Society of London (ZSL), the global synthetic fibre manufacturer Aquafil and the local partners.
- ✦ [Salva Mare](#), Italy.
- ✦ [A pesca por um mar Sem Lixo](#)
- ✦ [LIFE IP AZORES NATURA](#)

❖ Beach clean-ups as part of Corporate Social Responsibility

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: North Sea

Description: Some companies organise beach cleaning activities for their staff and their families. More than just removing plastics and other marine litter, those kind of actions help to better understand the potential impact of aquaculture activities, and raise awareness among the local communities.

Mowi company organizes a Global Clean-up Day every year since May 2018. Mowi staff and their families, join resources and mobilise a community effort to clean local beaches of plastics and other marine litter.



Figure 23— Clean up activity organised by MOWI company (© MOWI)

Helmepa, the Hellenic Marine Environment Protection Association, is a voluntary commitment of Greek seafarers and ship owners to safeguard the seas from ship-generated pollution. Helmepa has organised the beach cleanup action - “Clean Seas and Beaches” in Greece as part of their Corporate Social Responsibility.

Potential application context: The organization of beach cleaning activities for staff and their families can be nice initiatives for Portuguese companies to help reducing marine litter,

increase awareness and could improve the team spirit. These programmes can be included into Corporate Social Responsibility scheme, which improves the image of the companies.

Examples and/or locations:

- [CAP 2000](#)
- Windsurf in Normandy, France
- Surfrider in Southern Brittany, France

❖ Recycling programs for nylon nets and ropes

Type of aquaculture: Shellfish, Finfish, and Seaweed

Actual Implementation place: Baltic Sea

Description: The development of new recycling processes of nylon nets and ropes will avoid a large quantity of new plastics that would potentially end up in the sea. The recycling process re-converts the netting into new polyamide filament, which in turn can be used in a variety of applications, such as in the manufacture of swimwear or carpet yarn.



Figure 24— Fishing nets (©Nadine Doerlé)

In 2019, in Norway, Nofir collected 24 tons of discarded fishing nets from Antarctica's oceans. After the nets dismantle and clean, Nofir sent them off to Italy-based Aquafil to be processed into nylon yarn [ECONYL®](#).

Potential application context: The waste management company [AMBIBERICA](#), located in Braga, Portugal Mainland, recently launched a program of recycling fishing nets. The existing knowledge ground on recycling nets could be used to explore the possibility to recycle also gears and nets coming from the aquaculture sector.

The world of recycling and upcycling has no limit for creativity. Two portuguese artists are producing lamps made from fishing threads, in their project [RE-DE](#). Exploring partnerships between aquaculture sector and upcycling designers and artists could be feasible taking advantage of the already existing connection with the creative design industry and fishing sector.

Examples and/or locations:

- [Recycling programmes of nylon nets and ropes by Mowi](#)

➤ [AMBIBERICA](#)

➤ [RE-DE](#)

❖ An eco-anchor - scaling up sustainably

Type of aquaculture: Seaweed

Actual Implementation place: North Sea

Description: To upscale the seaweed sector in a sustainable way, the Noordzeeboerderij foundation initiated a project that focuses on building a sustainable anchoring system. The anchor that holds the sea farm in place, will be nature-friendly and built from safe materials. During the dismantling of the installation, the eco-anchor can be left in place and be reused in the next season. In the meantime, the anchor can function to create nature.

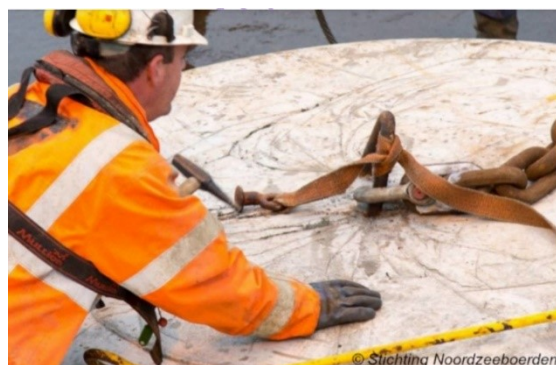


Figure 25— EC-ANCHOR (© Noordzeeboerderij foundation)

Potential application context: Seaweed is one of the potential production in the growing Azores aquaculture sector. This eco-installation can be considered a good solution for the new potential facilities in the archipelago.

Examples and/or locations:

➤ Noordzeeboerderij: [Eco-anchor](#), a sustainable anchoring system

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 39— 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 Portugal mainland 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 these regions, on top of the already existing legislations or measures in aquaculture companies. On the other hand, in the Azores region, aquaculture is considered one of the emerging sectors within the Blue Growth strategy, and it is currently only on a planning phase. Policy recommendations and prevention measures should be therefore, taken into consideration while laying a specific strategy for the sector.

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.

References

- 🐟 Realising the potential of the Outermost Regions for sustainable Blue Growth, EC, 2107 (file:///C:/Users/margherita.zorgno/Documents/0.1%20Projects/1_AQUA-LIT/WP5/Task%205.3/Literature/EA0117972ENN.en.pdf)
- 🐟 Rocha:
https://repositorio.ul.pt/bitstream/10451/30615/1/ulfc120821_tm_Carolina_Rocha.pdf
- 🐟 [https://www.europarl.europa.eu/RegData/etudes/note/join/2013/495852/IPOL-PECH_NT\(2013\)495852_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/note/join/2013/495852/IPOL-PECH_NT(2013)495852_EN.pdf).
- 🐟 Popescu, 2013:
[https://www.europarl.europa.eu/RegData/etudes/note/join/2013/495852/IPOL-PECH_NT\(2013\)495852_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/note/join/2013/495852/IPOL-PECH_NT(2013)495852_EN.pdf).
- 🐟 Pham, C.K., R.M. Higgins, M. De Girolamo & E. Isidro (Eds) 2008. Proceedings of the International Workshop: Developing a Sustainable Aquaculture Industry in the Azores. Arquipélago. Life and Marine Sciences. Supplement 7: xiii + 81 pp.
- 🐟 Programa de Monitorização do Lixo Marinho em praias Portugal, Apambiente.pt, 2017: https://apambiente.pt/_zdata/Instrumentos/Lixo%20Marinho/Relatrio%20Lixo%20Marinho%202017.pdf
- 🐟 Estrategia Marinha, Relatório do 2º ciclo, Governo dos Açores, 2020
- 🐟 Silva A, Vergílio M, Hipólito C, Kramel D, Pegorelli C, Medeiros A, Miranda P, Shinoda D, Caña Varona M, Porteiro F, Lopes I, Jorge V, Ara Oliveira M, Rodríguez Riesco JE, Jimenez Navarro S, González Gil S, Tello Antón O, Jiménez Jaén A, González Cabrera I, Rodríguez González MP, Proietti E, Herrera Rivero I, Calado H. 2019. Current Maritime Uses and Constraints in Macaronesia - Macaronesia. Deliverable - D.2.5., under the WP2 of MarSP: Macaronesian Maritime Spatial Planning project (GA nº EASME/EMFF/2016/1.2.1.6/03SI2.763106).
- 🐟 Action plan on marine litter for Lanzarote, Canary Islands. Nicole Andrea Ruckstuhl, Alicia Herrera Ulibarri, Genís Mir Baigol. Massive Open Online Course (MOOC) on Marine Litter Final Assignment Expert Track.
<https://webgate.ec.europa.eu/maritimeforum/en/node/4733>
- 🐟 <https://rea.apambiente.pt/content/aquaculture-production?language=en>
- 🐟 <https://www.cbd.int/doc/meetings/mar/mcbem-2014-04/other/mcbem-2014-04-pt-strategy-2013-2020-en.pdf>

ⁱ *Idem*

ⁱⁱ https://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/Marine_litter_vital_graphics.pdf

ⁱⁱⁱ <http://www.fao.org/aquaculture/en/>