AQUA-LIT

State of Play

North Sea

Baltic Sea

Mediterranean Sea

This project has received funding from the European Union's EASME-EMFF funding programme under grant agreement EASME/EMFF/2017/1.2.1.12/S2/04/S12.789391.

How can the aquaculture sector contribute to reducing marine litter?

Aquaculture is the fastest growing food-producing sector in Europe, with an annual expansion rate of 8% in the last three decades. With this growth rate, there is **an opportunity for such a booming industry to act as a precursor on fighting marine litter** by reflecting on preventive measures and innovative solutions on how to manage the non-organic waste, which could become exemplary and point out the path for other sectors.

Therefore, the AQUA-LIT project is developing a toolbox of solutions for preventing, reducing, removing and recycling non-organic waste that the aquaculture industry would be able to implement.

The AQUA-LIT Virtual Learning Lab is an **interactive workshop** that will assemble stakeholders from the aquaculture sector to exchange their insights and opinions about the issue of marine litter and discuss possible solutions.

The objectives of the Learning Lab are to:

- Federate and engage stakeholder communities in preventing, reducing, monitoring, quantifying, removing and recycling marine litter from aquaculture operations.
- Facilitate the adoption of successful existing solutions through capacity building.
- Explore the potential of innovative solutions to marine litter reduction, removal and recycling.
- Improve the understanding of the specific needs of stakeholders to maximise the impacts of the project.

Learning Lab expected outcomes

Participating stakeholders will co-design tools for preventing, reducing, monitoring, quantifying removing and recycling marine litter (e.g. polystyrene floats, plastic ropes, food sacks, buoys, etc.). They will make use of their experience, best practice, lessons learnt to share, assess and select the existing tools or design new ones.

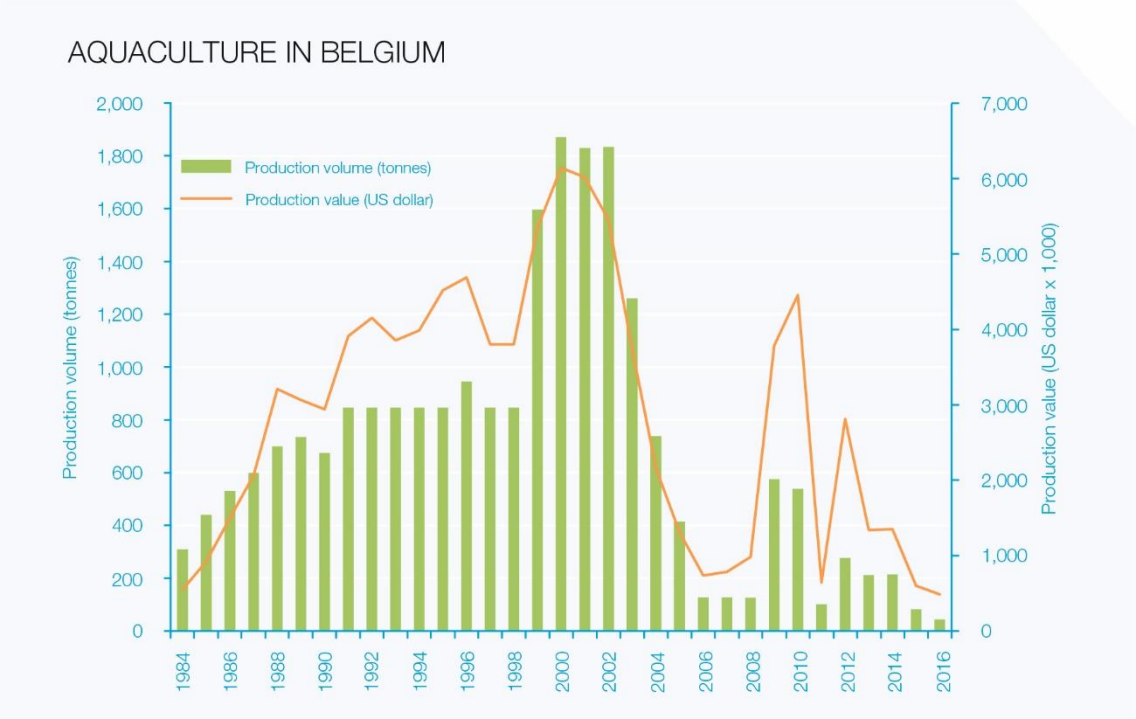
North Sea Context

NORTH SEA CONTEXT

In the North Sea fed aquaculture (fish), facilities are clustered in favourable areas in the outer regions of the Greater North Sea. Atlantic salmon (*Salmo salar*) is the most important aquaculture species in Europe that benefits from natural conditions with good sea temperatures, salinity and currents in sheltered fjords. Most of the farmed Atlantic salmon are produced in floating cages in sea, while there are a few land-based farms. Norway, followed by the UK, are the most important producing countries in Europe.

The extractive aquaculture (shellfish and seaweed) sector is gaining traction across the EU, with a wide range of commercial applications going beyond human consumption (e.g. poultry and fish feed, biofuel, chemistry, pharmaceuticals, etc.). In the North Sea, **mussel cultivation** (predominantly blue mussel, *Mytilus edulis*) is dominated by France and the Netherlands. Other smaller producers of the blue mussel are Denmark, Norway, Sweden and the UK. There are three different culture techniques - using poles ("bouchot"), suspended ropes or bottom culture. **Oyster farming** has a long history. After several years of decreasing production caused by the 2008 disease outbreak in French oyster farming areas, production has increased again since 2014 (European Commission, 2019). In Europe, commonly farmed oysters include the European flat oyster, *Ostrea edulis*, and the Pacific cupped oyster, *Crassostrea gigas*. In the North Sea, oyster culture is dominated by France, while the Netherlands and the UK have limited production capacity. **Marine macroalgae**, or seaweeds, are traditionally harvested for the extractrion of hydrocolloid for industrial purposes. EU macroalgae production is limited but the demand for edible algae is increasing in EU markets, and new production models and new market stream are emerging. In the North Sea, seaweed aquaculture is predominant in France and Norway (brown seaweeds). The majority of the production in France is wild seaweed that is harvested. Other countries (The Netherlands, Belgium) are investing in pilot studies.

The intra-European exchange of information and collaboration among institutions has been strong in the region. There is an emerging importance of producer organisations to provide members with information, as well as acting as fora to develop common policies on a wide range of issues. On the local level, there are several Mirror Platforms (MIPs) organised by the **local authorities, such as for example *het Vlaams Aquacultuurplatform* in Belgium.**



Annual aquaculture production and production value in Belgium (Bossier et al., 2018).

PREVENTION & REDUCTION OF MARINE LITTER

Each country in the North Sea has strict rules to be followed to make sure that there is no litter ending up in the environment. Currently, there are multiple solution and mechanisms available, several legally binding measures in force, and various action plans published to prevent and reduce marine littering from aquaculture in Europe. In this way, an environmentally sustainable development of the aquaculture sector can be ensured.

EXAMPLE:
The North Sea Commission's Marine Resources Group (MRG) drafted a resolution on marine litter, which was supported and adopted during the Annual Business meeting of the North Sea Commission (Conference of Peripheral Maritime Regions, CPMR) (CPMR, 2018). This resolution aims at expressing concern and raise awareness about the impact of marine litter in the North Sea. One of the recommendations that is of interest to the aquaculture sector is the following; 'Encourage green procurement: offer alternatives to plastics and produce/use plastics, which are designed to allow for greater durability, reuse and high-quality recycling'.

MONITORING & QUANTIFICATION OF NON-ORGANIC LITTER

In general, as in other EU coastal Member States, monitoring needs to be done in regard to WFD chemical (12 nm from baseline) and ecological (1 nm from baseline) status of coastal waters.

In the Greater North Sea, OSPAR is responsible for the monitoring and quantification of non-organic litter. OSPAR currently assesses beach litter and seabed litter as part of its monitoring and assessment programme. The OSPAR beach litter database contains fishing and aquaculture litter items, which are used in the AQUA-LIT project to produce the Marine Litter Inventory and several regional maps.

REMOVAL & RECYCLING OF NON-ORGANIC LITTER

Commonly farmers have their own disposal/waste collection procedures on their property and – from time to time – this will have to be disposed of in an approved manner, which follows the common regulations to be adhered to by most other industry. The recycling regulation also applies for specific materials such as paper, glass, cloth, and several other materials (depends on the region).

Developers usually have to think of the waste management and dismantling process, already at the project application stage - before they get the permission. In multiple North Sea countries, there are very clear obligations stated in the aquaculture farming permission. All the installations and equipment needs to be removed completely - everything that was brought in the water, build or put in the place, has to be removed to leave the area in the same state as it was before the farm. If there are doubts that you do not adhere to the permissions obligations you will not get a permission.

One of the suggestions is that aquaculture should not be singled out as an industry that needs special regulations when it comes to waste material (non-biological, construction, equipment, etc). There are many other small-scale industries with similar materials appearing from time to time or regularly as wastes, so disposal and recycling should be linked up, not to be costly only for the aquaculture (i.e. economies of scale). This would make the logistics for handling wastes more attractive for specialized companies.

Certainly, with the growth of the industry it would be advisable to have the aquaculture specific non-biological waste disposal and material recycling systems in place (i.e. standards, solutions and procedures). Thus, a viable solution might be in coupling together different small-scale industries which use the same type of materials; e.g. aquaculture combined with fishing or agriculture – so that a larger amount of waste (i.e. same material) may be collected. This way a critical mass of such material may be reached to then be collected and processed by recycling companies, thereby gaining an incentive to develop procedures. This would create a win-win situation as very small amounts occurring in irregular intervals require costly logistics and individual farmers may – despite tight regulations – be unable to afford the costly disposal and seek quietly illegal routes of disposal. Standards for material and equipment (including for some the lifetime limit or no-use conditions) in other industries are there already.

WHAT ARE THE KEY ISSUES / CHALLENGES?

POLITICAL

The North Sea has seen a variety of changes in aquaculture regulation across the countries, which to a certain extent reflects the high-level political support for the sector, or the lack of it. The status widely differs across the countries. In addition, Norway has his own legislation and is not part of the EU.

ECONOMIC

The commercial readiness of the North Sea aquaculture sector differs strongly across countries and types of aquaculture. In the Northern Greater North Sea there is a strong network of international players and a high density of large-scale fed and extractive aquaculture farms, while in the Southern Greater North Sea a smaller number of extractive aquaculture facilities are located.

SOCIAL/CULTURAL

While some countries have aquaculture as a traditional activity ('Bouchot', France) some others are just initiating pilot projects (Belgium).

TECHNOLOGICAL

The North Sea has seen many projects and initiatives focusing on innovative technologies, such as Integrated Multi Trophic Aquaculture (IMTA) and Recirculating Aquaculture Systems (RAS) (on land).

LEGAL

The regulation differs widely across the countries depending among other on the number of authorities involved in the licensing process and proximity to the shore.

ENVIRONMENTAL

The North Sea, in general, is characterised by its strong currents and frequent storms. Hence, the meteorological and environmental conditions are not always optimal for aquaculture activities. Frequent gear loss, and distant offshore farm locations, can therefore in some cases make aquaculture economically difficult.

WHO ARE THE STAKEHOLDERS INVOLVED?

1. Aquaculture farmers (fish, shellfish, seaweed)
2. Equipment manufacturers (e.g. of aquaculture material & gear)
3. Engineering, system design and construction companies
4. Academic research groups
5. Professional clusters, associations and platform representatives
6. NGOs
7. Governance (including policy makers & implementers, and port staff)
8. Classification and certification bodies
9. Companies processing waste (including waste recycling and incineration)
10. Communicators (media, press, science communicators)

TRIGGERING QUESTIONS

1 – How can the aquaculture industry be more effective in preventing and reducing its non-organic waste?

- What are the barriers to preventing and reducing the loss, damage or discard of gear and other equipment in the aquaculture sector?
- What are the (technical) innovative solutions, business models and (policy) measures to prevent or reduce the loss, damage or discard of gear and other equipment in the aquaculture sector?

2 - How can the aquaculture sector be more effective in monitoring and quantifying its non-organic waste?

- What are the monitoring systems for non-organic waste quantification that you have applied in your activity or that you know of?
- What monitoring measures and schemes should be introduced, improved or enforced to encourage and empower every stakeholder to tackle the issue efficiently?

3 - How can the aquaculture sector be more effective in removing and recycling its non-organic waste?

- What are the barriers to removal and recycling of gear and other equipment that is damaged, discarded or lost?
- What are innovative solutions and business models that can be used to remove or recycle the gear and other equipment that is damaged, discarded or lost?

Baltic Sea Context

BALTIC SEA CONTEXT

In the Baltic Sea fed aquaculture (fish) is not so prominent given the eutrophication increase concerns, and farmed fish production is more relying on land RAS (recirculating aquaculture systems). For example, to date there is one mussel farm in the German Baltic (Kiele Meeresfarm) and up to three fish farms with low profitability and unlikely future.

The extractive aquaculture is gaining traction in the Baltic sea and multiple mussel farms can be identified along the Baltic coast. The main technology used is the longline. Nevertheless, the seaweed farming as well as the Integrated Multi-tropic-aquaculture (IMTA) are also being increasingly explored. In the Baltic, it is difficult to locate the farms as these are moving often. Thus, the data point location in the map is usually a location of the company office rather than the farm itself. It is thus unclear how monitoring and assessment can be conducted or how traceable is potential litter from these farms.

Extractive aquaculture (shellfish and seaweed) sector is gaining traction across the EU, with a wide range of commercial applications going beyond human consumption (e.g. poultry and fish feed, biofuel, chemistry, pharmaceutcals, etc.). According to FAO, *Mytilus edulis* (Atlantic, North and Baltic Sea coasts) is one of the two core mussels species of European production. There are three different culture techniques - using poles (“bouchot”), suspended ropes or bottom culture

The intra-European exchange of information and collaboration among institutions has been strong in the region. There is an emerging importance of producer organizations to provide members with information, as well as acting as fora to develop common policies on a wide range of issues. On the local level, there are initiatives organised by the **local authorities, such as for example the ghost (net) fishing project in Sweden.**

PREVENTION & REDUCTION OF MARINE LITTER

Each country in the Baltic Sea has strict rules to be followed to make sure that there is no litter ending up in the environment; starting with noise covering electromagnetic waves and ending with toxins, plastic and any chemicals, metals or medication that may leak into the water.

EXAMPLE:
Germany has so far only one mussel & seaweed farm which is family owned and located in Kiel. The farmer tries not to produce any litter – he uses reusable mussel collectors and does not use disposable mussel socks any more. In Germany those installing the farm are not allowed to leave any litter behind. Aquaculture business is considered as any other industry when it comes to disposal of broken parts or dismantled units: the aquaculture related industrial waste is not to be disposed as a general garbage (except for those elements particularly permitted).

MONITORING & QUANTIFICATION OF NON-ORGANIC LITTER

In general, as in other EU coastal Member States, monitoring needs to be done in regard to WFD chemical (12 nm from baseline) and ecological (1 nm from baseline) status of coastal waters.

The HELCOM database in the Baltic Sea contains fishing and aquaculture litter items which have been used in the AquaLit project to produce the maps.

REMOVAL & RECYCLING OF NON-ORGANIC LITTER

Commonly farmers have their own disposal/waste collection procedures on their property and – from time to time – this will have to be disposed of in an approved manner which follows the common regulations to be adhered to by most other industry. The recycling regulation also applies for specific materials such as paper, glass, cloth, and several other materials (depends on the region).

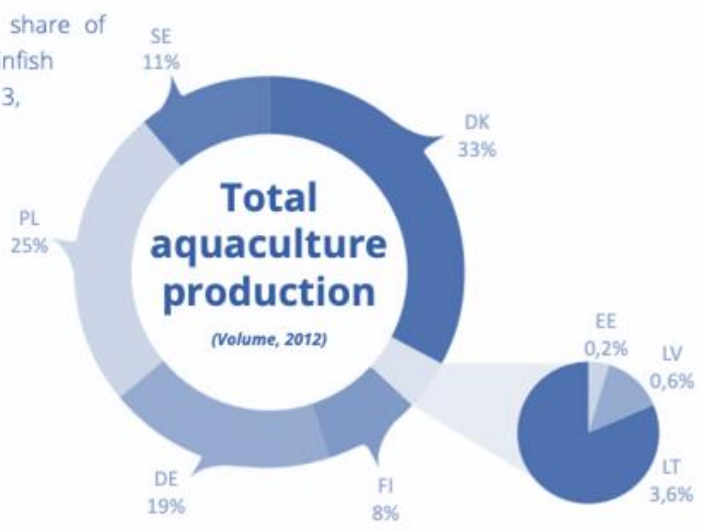
Developers usually have to think of the waste management and dismantling process, already at the project application stage - before they get the permission. In Germany for example, there are very clear obligations stated in the aquaculture framing permission. All the installations and equipment need to be removed completely - everything that was brought in the water, build or put in the place, has to be removed to leave the area in the same state as it was before the farm. If there are doubts that you do not adhere to the permissions obligations you will not get a permission in Germany. Aquaculture systems will have to obtain a licence to operate and in most of the “Länder” there are various licencing procedure in place requires everyone to follow general waste disposal and recycling laws.

One of the suggestions is that aquaculture should not be singled out as an industry that needs special regulations when it comes to waste material (non-biological, construction, equipment, etc). There are

many other small-scale industries with similar materials appearing from time to time or regularly as wastes, so disposal and recycling should be linked up, not to be costly only for the aquaculture (i.e. economies of scale). This would make the logistics for handling wastes more attractive for specialized companies.

Certainly, with the growth of the industry it would be advisable to have the aquaculture specific non-biological waste disposal and material recycling systems in place (i.e. standards, solutions and procedures). Thus, a viable solution might be in coupling together different small-scale industries which use the same type of materials; e.g. aquaculture combined with fishing or agriculture – so that a larger amount of waste (i.e. same material) may be collected. This way a critical mass of such material may be reached to then be collected and processed by recycling companies, thereby gaining an incentive to develop procedures. This would create a win-win situation as very small amounts occurring in irregular intervals require costly logistics and individual farmers may – despite tight regulations – be unable to afford the costly disposal and seek quietly illegal routes of disposal. Standards for material and equipment (including for some the lifetime limit or no-use conditions) in other industries are there already.

Baltic aquaculture accounts for a significant share of the total European aquaculture output of finfish species. However, in the period 2009–2013, the aquaculture industry slowed down. The sector makes the most of its technological developments, innovation, and synergies with other sectors, such as tourism, traditional fisheries, and co-location with offshore wind farms. Recently, recirculating aquaculture systems have become more common, encouraging concentration on more valuable species.



WHAT ARE THE KEY ISSUES / CHALLENGES?

POLITICAL

The Baltic Sea has seen a variety of changes in the aquaculture regulation across the countries, which to a certain extent reflects the high-level political support for the sector, or the lack of it. The status widely differs across the countries.

ECONOMIC

The commercial readiness of the sector differs across the countries in the Baltic Sea. In general the marine aquaculture is still a small scale and developing sector in the Baltic Sea mainly focusing on the extractive species.

SOCIAL/CULTURAL

While some countries have aquaculture as a traditional activity (sea gardens in Denmark) some others are just initiating some first businesses (Germany).

TECHNOLOGICAL

The Baltic Sea has seen many projects and initiatives focusing on the Integrated Multi Trophic Aquaculture (IMTA) and Recirculating Aquaculture Systems (RAS) (on land).

LEGAL

The regulation differs widely across the countries depending among other on the number of authorities involved in the licensing process and proximity to the shore.

ENVIRONMENTAL

Baltic Sea in general has concerns about the eutrophication, thus not all types of aquaculture are perceived the same. Thus, IMTA is seen as a viable option and there are also projects looking at the ability of mussels and seaweed to combat eutrophication and climate change (i.e. natural CO2 sequestration).

WHO ARE THE STAKEHOLDERS INVOLVED?

1. Aquaculture farmers (fish, shellfish, seaweed)
2. Equipment manufacturers (e.g. of aquaculture material & gear)
3. Engineering, system design and construction companies
4. Academic research groups
5. Professional clusters, associations and platform representatives
6. NGOs
7. Governance (including policy makers & implementers, and port staff)
8. Classification and certification bodies
9. Companies processing waste (including waste recycling and incineration)
10. Communicators (media, press, science communicators)

TRIGGERING QUESTIONS

1 – How can the aquaculture industry be more effective in preventing and reducing its non-organic waste?

- What are the barriers to preventing and reducing the loss, damage or discard of gear and other equipment in the aquaculture sector?
- What are the (technical) innovative solutions, business models and (policy) measures to prevent or reduce the loss, damage or discard of gear and other equipment in the aquaculture sector?

2 - How can the aquaculture sector be more effective in monitoring and quantifying its non-organic waste?

- What are the monitoring systems for non-organic waste quantification that you have applied in your activity or that you know of?
- What monitoring measures and schemes should be introduced, improved or enforced to encourage and empower every stakeholder to tackle the issue efficiently?

3 - How can the aquaculture sector be more effective in removing and recycling its non-organic waste?

- What are the barriers to removal and recycling of gear and other equipment that is damaged, discarded or lost?
- What are innovative solutions and business models that can be used to remove or recycle the gear and other equipment that is damaged, discarded or lost?

Mediterranean Sea Context

How can the aquaculture sector contribute to reducing marine litter in the Mediterranean Sea?

AQUA-LIT is an EMFF-EASME 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.**

This project is developed by a consortium of 7 European organizations, including research institutions, public bodies, non-profit organisations and consultancies: Instituto Español de Oceanografía-Centre Oceanogràfic de Balears (IEO-COB, Spain), Geonardo (Hungary), EurOcean (Portugal), Flanders Marine Institute (Belgium), S.Pro (Germany), Regional Fund for Science and Technology (Portugal) and Nausicaá (France).

To fulfill this mission, we work face-to-face with aquaculture stakeholders in three **regional Learning Labs**: the Baltic Sea and the North Sea regions (which took place in October and November 2019) and at the **Mediterranean basin.** 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'.**

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.

Aquaculture is the fastest growing food-producing sector in Europe, with an annual expansion rate of 8% in the last three decades (1). With this growth rate, there is **an opportunity for such a booming industry to act as a precursor on fighting marine litter** by reflecting on preventive measures and innovative solutions on how to manage the non-organic waste, which could become exemplary pointing out the path for other sectors.

THE MEDITERRANAN SEA CONTEXT

In the Mediterranean Sea a wide variety of **finfish** are farmed, of which the **European seabass (*Dicentrarchus labrax*)** is one of the main species. Most farmed European seabass are produced in floating sea cages, with a few produced-on land-based farms (1). The **gilthead seabream** (*Sparus aurata*) is the second most produced species in this region of Europe. This species is normally reared in sea cages, but some land-based systems can be also found (1). According to producing countries, after Turkey, Greece is the largest aquaculture producer of seabass and seabream in the Mediterranean Sea, followed by Spain and Italy (1).

According to the **Atlantic bluefin tuna** (*Thunnus thynnus*), this corresponds to a quota species present in both the Mediterranean and the eastern Atlantic Sea with a high market value. Due to the stagnation in the yield of the wild fisheries, countries are trying to exploit the quota to the fullest and raise wild-caught specimens in aquaculture conditions for the purpose of increasing fat content**.** Regarding the tuna, Malta, Croatia and Spain are countries bordering the Mediterranean Sea practicing aquaculture in the greatest volume.

According to invertebrates, mussel species are a major aquaculture product in several European countries, being the blue mussel (*Mytilus edulis)* and the Mediterranean mussel (*Mytilus galloprovincialis*) the core of European production (1). In fact, the production of aquaculture mussels is much larger than the production by mussel fishing (1).

In the Mediterranean Sea, France, Italy and Spain are the main producers of the Mediterranean mussel while Slovenia, Turkey, Greece, Croatia, Albania and Montenegro contribute to a lesser extent to the mussel production in this region (1). The most common production method used in the Mediterranean countries is called "**on ropes"**. Regarding this type of production, mussels are attached to ropes that are suspended vertically in the water from a fixed or floating structure. This technique is suitable for seas with weak tides like the Mediterranean Sea and it is now is being introduced in the Atlantic Ocean. Mussels are harvested by raising the ropes out of the water and removing the clusters (2).

According to other species of invertebrates, most farmed **clams** come from Italy, and the other clam farming countries are France, Spain and Slovenia, while the oyster farming countries are France, Spain, Italy, Croatia and Malta (1).

Marine **macroalgae, or seaweeds,** are traditionally harvested for the extraction of hydrocolloid for industrial purposes. EU macroalgae production is limited but the demand for edible algae is increasing in EU markets, and new production models and market stream are emerging (1). Among the Mediterranean Countries, Spain (mostly red algae) and Italy (green and red algae) are the main producers (1).

In Spain, mussel farming is by far the biggest sector of aquaculture in terms of production volume, representing three quarters of the total aquaculture output, with mussel cultured in Galicia being the driving force (1). In this country, the most common rearing method is the "batea" which consist of a

floating nursery suspended by a system of floats, consisting of a lattice (traditionally made of eucalyptus wood) of rectangular shape on which the mussels are attached to the hanged ropes (3). Long-lines can also be found in some areas of the country like Andalucía (4).

On the other hand, sea bream and sea bass are the main finfish species produced (5) in this country and are usually grown in floating sea cages, although tanks and ponds on land can be used (especially for hatcheries) (4).

The items and structures that are used in the aquaculture facilities can sometimes be lost (after a storm, for example), discarded or abandoned. Big items like buoys can be easily be tracked, but there is a remaining problem regarding small and non-valuable items like mussels' socks/nets, gloves or tags, which can easily end up in the sea.

AQUACULTURE MARINE LITTER IN THE MEDITERRANEAN SEA BASIN

One of the main objectives of the project is to set up a solid knowledge base on marine litter from aquaculture activities. Therefore, a dataset focused on the information on the main types of debris was created, considering the quantities in which they occur in the marine environment of the Baltic Sea, North Sea and Mediterranean Sea basins. Please check https://aqua-lit.eu/resources/marine-litter-inventory for more information.

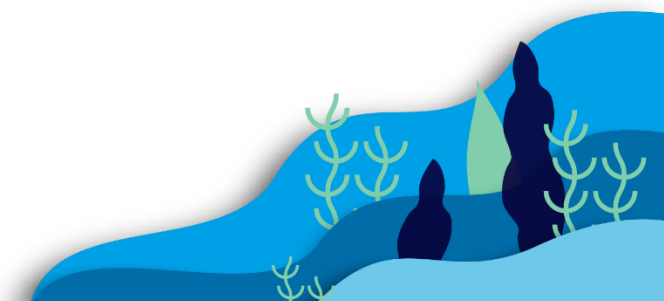
Within this task, several geographical maps were created to visualise the regional waste problems and knowledge gaps regarding the aquaculture activities. The multiple results can downloaded from https://aqua-lit.eu/resources/media-centre.

In this scenario, data on aquaculture litter in the Mediterranean Sea were gathered through Marine LitterWatch database and scientific papers, with the highest amount of data coming from the Italian Eastern coast. In general, bivalve nets and bags were the most common items founds, mainly in neighbouring regions of countries with high shellfish farming activity (Western Mediterranean Sea along the coastline of Spain, France, Italy and Greece). This may give an indication of the potential source of the mussel nets found on these beaches. The second most commonly found item were fish tags. Interestingly, fish tags were most frequently found on Italian beaches and beaches along the Adriatic Sea where no fish farms were registered. Hence, this gives an indication of fish tags possibly arriving by means of ocean circulation and hydrodynamics (1).

In general, most of the litter items consist of plastic (more than 90%), and the highest % of aquaculture items is found on the seafloor.

THE THREE MAIN COMPONENTS TO TACKLE MARINE LITTERING

One of the main deliverables of the project was to create an overview of the global, regional, European and national action plans and documents that contain measures to reduce or avoid marine litter from the aquaculture sector. The document *D 2.3 Available tools and measures* can be downloaded from https://aqua-lit.eu/resources/deliverables.



The objective of this section is to provide some examples of the action plans and policies that are already in place in the three sea basins included in the project: Baltic Sea, North Sea and Mediterranean Sea.

PREVENTION & REDUCTION OF MARINE LITTER

The main objective of the Regional Plan for Marine Litter Management in the Mediterranean (UNEP, 2013) is to prevent and reduce marine litter pollution in the Mediterranean Sea. Appendix 1 of this document consists of a work plan with timetable for the implementation of the relevant Articles of the Marine Litter Regional Plan; some of them are strongly related to the waste related to aquaculture.

Examples of actions from the Regional Plan for Marine Litter Management in the Mediterranean that may be of interest in the context of aquaculture-related waste are: Action 10. Prevention measures related to the establishment of mandatory Deposits, Return and Restoration System for expandable polystyrene (EPS) boxes; • Action 15. "Gear marking to indicate ownership" concept; • Action 15. Reduced ghost catches using environmental neutral upon degradation of nets, pots and traps.

In the Spanish context, The JACUMAR report (Junta Nacional Asesora de Cultivos Marinos, 2008) of the National Advisory Board for Marine Cultures (Ministry for Agriculture, Fisheries and Food) formulated several measures/strategies tailor-made for the aquaculture farmer to prevent littering, including guidelines on how to create a Minimization Plan for an aquaculture company and identifying some minimization measures to be implemented in aquaculture facilities. As a result of the JACUMAR report, the "Guide for the minimisation of aquaculture waste" was published. An updated version was also published in 2017 by the Spanish Aquaculture Observatory (OESA), with the collaboration of AZTI.

The 2014-2020 Spanish Aquaculture Strategic Plan (PEAE) includes a section focused on management and reutilization of waste items and makes a special emphasis on the need to develop pilot projects considering the social, economic and environmental point of view of the aquaculture waste management.

MONITORING & QUANTIFICATION OF NON-ORGANIC LITTER

In general, as in other EU coastal Member States, monitoring marine litter needs to be done in regard to WFD chemical (12 nm from baseline) and ecological (1 nm from baseline) status of coastal waters.

Monitoring protocols exist (UNEP, 2009, MSFD/Galgani et al., 2013, UNEP/MAP, 2014) that take into consideration a standard list of categories of litter items in order to enable the comparison of results. In the case of the aquaculture items, there is a big gap of knowledge that needs to be solved, due to most of them are quantified and monitored as fishery derived items.

REMOVAL & RECYCLING OF NON-ORGANIC LITTER

The Regional Plan for Marine Litter Management in the Mediterranean also focuses on the recycling and reusing component (UNEP, 2013). In Italy, Aquaculture farms are treated as terrestrial farms, therefore they have to comply to specific law on waste management.

Non-organic litter recycling of the items that are collected in the sea can be very difficult due to the level of degradation, because some of them like ropes or nets have been manufactured by mixing multiple types of plastics, or due to there is no specific disposal areas paced in ports to enhance and facilitate the involvement of the fishermen and the aquaculture farmers.

The Action number 7 from the Regional Plan for Marine Litter Management in the Mediterranean is an example of these initiatives: extended Producer Responsibility strategy by making the producers, manufacturer brand owners and first importers responsible for the entire life cycle of the product, with measures prioritizing the hierarchy of waste management in order to encourage companies to design products for reuse and recycling.

One good example is the new Italian #SalvAmare draft law requires that Fishermen will be allowed to bring plastic they find caught in their nets and will be able to deposit it in specific recycling areas placed in ports and they will be provided with an environmental certificate attesting their commitment to the sea and sustainable fishing.

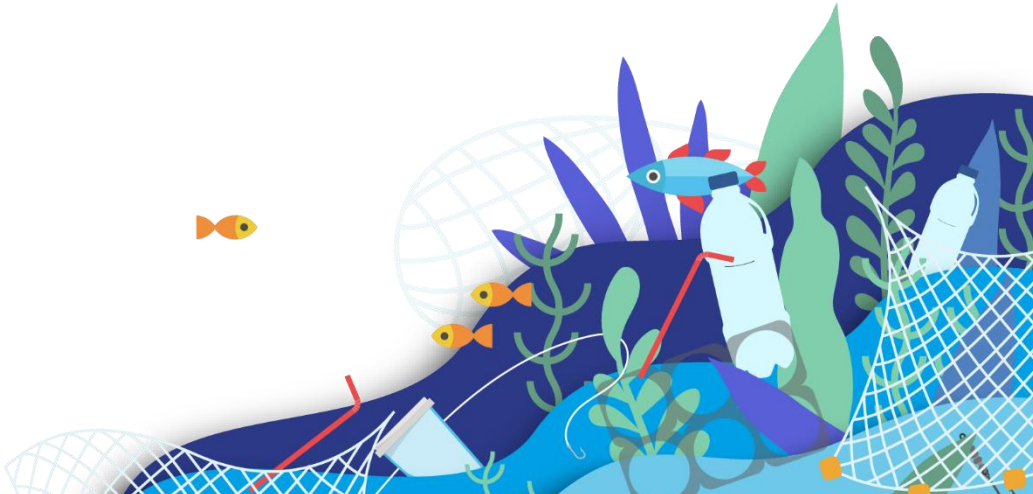
CHALLENGES

- Aquaculture is going to be essential in the Mediterranean area to cover the food needs in the next 10 years. Therefore, there is a need to avoid that the aquaculture activity increase may be accompanied with an increase of the associated marine debris.
- There is a need of rising the awareness on marine debris related to aquaculture activities in all the sectors involved: policy makers, waste management organizations, manufacturers, farmers, etc.
- **Data gaps** (in part due to the lack of aquaculture items specific monitoring, usually accounted as fishery items)and **not harmonised monitoring programmes** (lack of standardization and compatibility between methods used and results obtained in these projects).
- Conflict between business on using space (e.g. disposal point not possible because close by a touristic zone).
- Lack of development of a specific waste management protocol for aquaculture activities (that maybe could also include the fishery activities). Off-shore farms rarely have specific dumping point in the port, where mussel socks and other litter can be accumulated before their disposal
- The regulation differs widely across the Mediterranean countries depending among other on the number of authorities involved in the licensing process and proximity to the shore.

WHO ARE THE STAKEHOLDERS INVOLVED?

The stakeholder categories considered throughout the whole project and, specifically, for the organization of the Learning Labs involve people operating in multiple stages of the aquaculture farm life cycle:

1. Aquaculture farmers (fish, shellfish, seaweed)
2. Equipment manufacturers (e.g. of aquaculture material & gear)
3. Engineering, system design and construction companies
4. Academic research groups
5. Professional clusters, associations and platform representatives
6. NGOs
7. Governance (including policy makers & implementers, and port staff)
8. Classification and certification bodies
9. Companies processing waste (including waste recycling and incineration)
10. Communicators (media, press, science communicators)
11. Circular economy and aquaculture consultancy companies



TRIGGERING QUESTIONS

1 – How can the aquaculture industry be more effective in preventing and reducing its non-organic waste?

- What are the barriers to preventing and reducing the loss, damage or discard of gear and other equipment in the aquaculture sector?
- What are the (technical) innovative solutions, business models and (policy) measures to prevent or reduce the loss, damage or discard of gear and other equipment in the aquaculture sector?

2 - How can the aquaculture sector be more effective in monitoring and quantifying its non-organic waste?

- What are the monitoring systems for non-organic waste quantification that you have applied in your activity or that you know of?
- What monitoring measures and schemes should be introduced, improved or enforced to encourage and empower every stakeholder to tackle the issue efficiently?

3 - How can the aquaculture sector be more effective in removing and recycling its non-organic waste?

- What are the barriers to removal and recycling of gear and other equipment that is damaged, discarded or lost?
- What are innovative solutions and business models that can be used to remove or recycle the gear and other equipment that is damaged, discarded or lost?

Find out more at:

https://aqua-lit.eu/regions/learning-labs

AQUA-LIT

This project has received funding from the European Union's EASME-EMFF funding programme under grant agreement EASME/EMFF/2017/1.2.1.12/S2/04/S12.789391.