

# PLAYERS AT PLAY



## COUNTRY PROFILE: DENMARK



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.



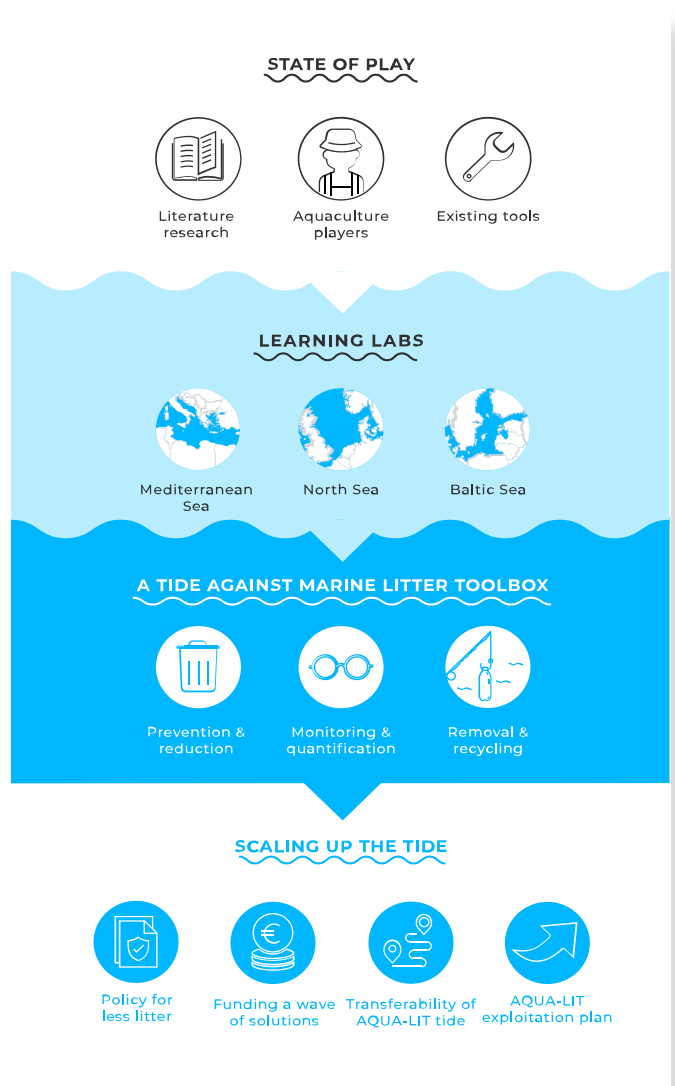
# AQUA-LIT project

**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 fulfill 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.



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## 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)**



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## AQUA-LIT country profiles

The AQUA-LIT country profiles present a description of the different aquaculture stakeholders, categorised by the four different stages in the life cycle of an aquaculture farm: 1) Initiation, 2) Development, 3) Operation and 4) End of life.

The country profiles were compiled for the two most extensively studied countries in each of the three sea basins of the AQUA-LIT project: Italy and Spain in the Mediterranean Sea, Belgium and France in the North Sea and Denmark and Germany in the Baltic Sea.

The country profiles resulted from various stakeholder engagement processes carried out during the project: the [interactive workshops](#) as well as individual stakeholder interviews. More information on the contributions from the aquaculture stakeholders can be found in the Learning Lab reports of the [Mediterranean Sea](#), the [North Sea](#) and the [Baltic Sea](#).

The country profiles can also be consulted in the annex of the [Knowledge Wave on Marine Litter from Aquaculture Sources](#).



## Annex 7: Country profiles – Baltic Sea

# DENMARK

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Total annual aquaculture production in Denmark was around 45 600 tonnes in 2019<sup>4</sup>. Earnings from the aquaculture sector were about Euro 156 million, making it worth more than the economically important Danish cod fisheries; about 90 percent of production goes for export, mainly to EU countries. Sea cage farming in Denmark was introduced in the 1970s and now represents 27% of the total trout production. Production has been growing since 2008 and products include both meat and eggs. Around 70% of the farming takes place in the Baltic Sea area. Farming blue mussels on long lines is an activity that started in 2006, and total volumes reached 2 221 tonnes in 2016. Farming takes place mainly in the Limfjord in the northern part of Jutland, but also in the Skagerrak and Kattegat. However, mussel farms are not yet economically viable, but Vilsund Blue A/S and other Danish companies hope that the state will provide some kind of compensation for the ecosystem services that mussels provide. One simple solution could be the state subsidising mussel meal as animal feed by paying the difference in price to conventional feed. Altogether, there were 563 full or part time employees in total in the aquaculture industry in 2017.<sup>5</sup>

Danish aquaculture is strictly regulated by environmental rules, with the exception of full recirculation eel farms, all Danish fish farms have to be officially approved in accordance with the Danish Environmental Protection Act. A fixed feed quota is assigned to each individual farm in addition to specific requirements including feed conversion ratios, water use and treatment, effluents, removal of waste and offal, etc.

### Initiation

#### Bodies approving the aquaculture technology (classification bodies)

The Fisheries Act (2004, as amended in 2005 and 2019) regulated the management, control and development of aquatic resources in Denmark. Chapter 13 addresses ocean farming and establishes a licensing system governing the establishment and operation of mariculture facilities. Due to the Act, the Minister of Food, Agriculture and Fisheries has the general power to make regulations with regard to the issuing of licences for the establishment and operation of ocean farms. The Regulation on the establishment and operation of ocean farms (1991) sets forth more detailed rules on the licensing system of mariculture facilities. The issuing of licences has been delegated to the Danish Directorate of Fisheries.

Environmental approval is the legal basis of prime importance as it functions as a vehicle for almost all other legal fields. The environmental approval document combines various legal areas, which in other countries would not belong to “environment” (e.g. consideration of noise

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<sup>4</sup> Statistics Denmark, 2019

<sup>5</sup> <https://www.eurofish.dk/denmark>

emissions, water extraction and discharge, use of chemicals and medicine). It can be as much as 70 pages long, when it covers an Environmental Impact Assessment and a habitat assessment in the same documents. This approval has a validity of 10 years and specifies the limitations and thresholds, including feed type and substances, in the highest level of detail of all the Baltic Sea countries. The level of complexity of this environmental permission document shows the challenges a farmer in Denmark faces in the process of seeking permission for production. In many cases, consultants and other experts prepare the application for the farmer with significant costs.

The change in legislation in Denmark towards discharge-based regulation instead of feed-input is a good incentive towards the use of Best Available Technologies (BAT). It was introduced on a voluntary basis, i.e. farms that are not in a position to implement the level of BAT required, are allowed to continue their production under the old legal framework. Such farms, in effect, are then slowly pushed out of the market. The 10-year validity of approvals is by no means in harmony with other factors such as the accessibility of bank loans and other structural bottlenecks to business enterprises, hence it can be assumed that Denmark is going to lose many of its traditional farms due to this shift.

For the fish farming of mussels, oysters etc., an application for a licence shall be filed with the Directorate of Fisheries in accordance with the Instruction on Applications for Bivalve Aquaculture in the Limfjord (2003).

The amendment of the Fisheries Act in 2005 created the opportunity to issue requirements concerning practical and theoretical training as a condition for obtaining a farming licence. The background to this is provided by greatly increased requirements in terms of the environment, hygiene and general farming methods. Development in the direction of ever greater and technologically more advanced units with complicated finances highlights a greater need for more formalised, theoretical aquaculture training. The engineer's degree course in Aquatic Technology at Aalborg University offers a specialisation in aquaculture.<sup>6</sup>

The Danish Shellfish Centre, in collaboration with Danish Shellfish Farming Association and Northwest Jutland Education Centre offers an evening and weekend course at which participants are given basic theoretical and practical knowledge about shellfish farming.

### **Aquaculture installations & system designing & engineering companies**

Under the amended Fisheries Act (2019)<sup>7</sup> 3 former statutory orders were combined into 1 for special fish farm installations (fresh water and mariculture) to create incentives for the fish farmers to produce more fish while reducing their environmental pollution.

Danish manufacturers have a long tradition in producing gear for fisheries and aquaculture systems. The majority, however, is still not focusing on circular design options. In the near

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<sup>6</sup>

[http://naturerhverv.dk/fileadmin/user\\_upload/NaturErhverv/Filer/Tilskud/Projekttilskud/Fiskeriudvikling/Fiskeriudviklingsprogram\\_2007-2013.pdf](http://naturerhverv.dk/fileadmin/user_upload/NaturErhverv/Filer/Tilskud/Projekttilskud/Fiskeriudvikling/Fiskeriudviklingsprogram_2007-2013.pdf)

<sup>7</sup> see also Notice on the assessment of certain public and private installations' impact on the environment (EIA) under the Planning Act [Bekendtgørelse om vurdering af visse offentlige og private anlægs virkning på miljøet (VVM) i medfør af lov om planlægning]. 2015. BEK 1832. Available from: <https://www.etsinformation.dk/Forms/R0710.aspx?id=176542>

future, it might be possible that they are turning towards strict sustainability in their systems, including the reduction or prevention of marine litter caused by their systems. The suppliers OxyGuard International A/S offer, for example, installations for the water quality assays for aquaculture, and KM Fish Machinery A/S – for shrimp processing. The leading European distributor – Brammer Group – demonstrates not only a wide range of components intended for manufacturing at various levels, but also the service for additional technical expertise, including the prevention of aquaculture equipment.

Inventory for work in modern aquaculture systems like lifting devices, insulating tape or wire clips is currently performed by Greenline Fishing Gear A/S.<sup>8</sup>

The Murman FishProducts multi-business company is starting to offer services for the supply of more sustainable gear and industrial equipment, as well as the restoration of aquaculture plant systems and fishing boats, used to reach the aquaculture plants.

Eco-friendly packaging made of foamed polystyrene, which is suitable for recycling, has been developed by the manufacturer EPS-Recycle.

### **Authorities approving the aquaculture farm (i.e. public authorities)**

The aquaculture sector is regulated by the Fisheries Act under the Ministry of Food, Agriculture and Fisheries and is mainly governed through the implementation of environmental regulations. The application process is steered by the same authority (district or municipal)<sup>9</sup> and this authority is responsible for including the other legal areas and the respective authorities. In this respect, the environmental permission is a vehicle for the whole process. Only the planning and building permission is exempted from this but does not seem to be a burning topic for the farmers. If the farm is located in or near protected area, or area with restrictions of importance for the fish farm, the permitting authority is the Nature Conservation Board.

Taking into account local conditions, the environmental approval also includes aspects of Best Available Technology (BAT), e.g., farm construction and operating equipment, including cleaning devices, feed composition and feeding management, process technology, vaccination, and use of medicine and chemical additives. In connection with achievement of the required environmental approvals, most traditional farms (trout and others) have become more technological; no standardized techniques have been applied, as fish farmers often use locally developed solutions.

The permission system in Denmark foresees the possibility to appeal to a specialised board. The Environmental Board of Appeal is the central board of appeal for all matters relating to nature, planning and the environment.

In a typical Danish mariculture, trout at about 1 kilo weight in spring are transferred from freshwater ponds to offshore net cages. Feed is distributed by machines to the cages from a boat, or from a platform via hoses to each of the cages. In autumn or early winter the fish are

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<sup>8</sup> <https://rusfishexpo.com/en/info/news/na-seafood-expo-russia-2019-vpervye-budet-organizovan-obedinenny-natsionalnyy-stend-danii/>

<sup>9</sup> In Denmark there are 98 municipalities.

harvested at a size of about 2-5 kilo. Due to the risk of ice during cold winters, the sea around Denmark is not suitable for mariculture all year around. Therefore at the end of the season, the cages are taken shore for maintenance and repair and also for storage until the following spring. The responsible regional (district or municipal) authority is controlling this process.

## Development

### Those constructing, bringing, assembling the farm

Danish gear producers often offer support in bringing and assembling the farms to the specific location at sea. However, many farmers bring the necessary signals and bouys themselves to reduce costs. They also mark their offshore systems with taggers and GPS. Nearshore they work with cardinal buoys (marking system at sea).

One company, the AKVA group Denmark is one of the leading supplier of fish farms in Denmark, using increasingly environmentally friendly technologies and gear materials. It offers several offshore and near-shore fish farming systems, also based on extensive knowledge gained through their work around the world by the overarching AKVA group. One service they offer, is the construction and assembling of their systems.

## Operation

### Aquaculture producers and operators

Marine aquaculture started in the 1970s, but the conditions in the inner Danish waters are not ideal. There is occasional ice cover and sensitive eco-systems limit the discharge of nutrients, which limits growth of marine aquaculture. In 2010 there were 19 farms in the inner Danish waters, which produced 10 300 tonnes with a value of DKK 318 million (equivalent to approx. EUR 42.6 million).

In recent years several attempts have been made to produce mussels in the marine environments. In the sheltered areas of the Limfjord and elsewhere various arrangements for producing mussel production on ropes have been tested and success came in 2003. Since then production on 21 sites have risen to a 2 600 tonnes (value DKK 13.1 million, equivalent to approx. EUR 1.8 million).<sup>10</sup>

Based on Denmark's European Maritime and fisheries Fund (EMFF) Operational Programme 2014–2020, the key objectives in aquaculture are increasing aquaculture production by 25%, increasing organic production to at least 10% of total production, and increasing the export of aquaculture production by 25%.

One of the aims of the Operational Programme is to reinforce the processing and marketing of fisheries and aquaculture products through innovation, certification, traceability, and other suitable measures. This will strengthen the sector's competitiveness and ensure environmentally sustainable production. For example, the volume of Aquaculture Stewardship Council (ASC) certified aquaculture production is expected to increase significantly through 2020.

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<sup>10</sup> [https://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/513972/IPOL-PECH\\_ET\(2013\)513972\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/513972/IPOL-PECH_ET(2013)513972_EN.pdf)



Applied research related to aquaculture in Denmark is mainly undertaken by the Danish Institute for Fisheries Research (DIFRES) under the Ministry of Food, Agriculture and Fisheries as well as a few other government-run research institutions. They are financed by basic funding from the ministry, linked to result contracts, as well as by allocations from different sources on the basis of specific research projects. The main fields of research are total production concepts applying to all life cycle stages of the fish/shellfish. During the last two years research has been started with a view on a circular economy system, however, only very few projects exist.

### Pilot projects

- 🐟 Baltic Aqua Innovation Denmark – a new demonstration platform aims to analyse the local potential of aquaculture and testing several aquaculture business approaches (mussels and seaweed, sustainable marine fish farming, alternative proteins). The Vision is to create a platform to support business development, communication and education.<sup>11</sup>
- 🐟 Production platforms in areas of open sea - in connection with offshore wind farms, for example - offer appreciable growth potential in the aquaculture of the future. DTU Aqua is involved in the development and establishment of a pilot facility for offshore aquaculture that can be submerged in the event of bad weather. The activities within innovation and industrial collaboration are typically carried out in projects supported by the European Maritime and Fisheries Fund (EMFF) and the Green Demonstration and Development Programme (GUDP).<sup>12</sup>
- 🐟 DTU Aqua is researching the development of rearing systems and technologies that ensure efficient production with minimum environmental impact. The research focuses in particular on weather proofed farming systems and environmental friendly technologies.<sup>13</sup>
- 🐟 Several approved technological institutes take part in fisheries and aquaculture research. Among them are FORCE Technology, which has hydrodynamic expertise in aquaculture systems and the Technological Institute (TI), with expertise in environmental aspects of food production, including the reduction of littering by aquaculture plant constructions.
- 🐟 Some of the above institutions are present in the fisheries centre in Hirtshals. The North Sea Science Park (previously known as The North Sea Centre). The large Norwegian science foundation SINTEF Fisheries and Aquaculture also has an office in the North Sea Science Park, where it manages a large 1.200 m<sup>3</sup> test tank, inter alia for aquaculture gear under harsh weather conditions.<sup>14</sup> Research findings are transferred to the Baltic Sea area if applicable.
- 🐟 Denmark is a global hub for the development of fishing gear and to some extent the development and production of fish/aquaculture processing equipment - the result of

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<sup>11</sup>[https://www.submariner-network.eu/images/projects/smartblueregions/SBR\\_conference\\_PRESENTATIONS/Workshop\\_3\\_Jørgensen\\_and\\_Dolmer-min.pdf](https://www.submariner-network.eu/images/projects/smartblueregions/SBR_conference_PRESENTATIONS/Workshop_3_Jørgensen_and_Dolmer-min.pdf) and <https://www.dti.dk/projects/project-innoaquatech/37722>

<sup>12</sup> <https://www.aqua.dtu.dk/english/innovation>

<sup>13</sup> <https://www.aqua.dtu.dk/english/research/aquaculture>

<sup>14</sup>[https://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/513972/IPOL-PECH\\_ET\(2013\)513972\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/513972/IPOL-PECH_ET(2013)513972_EN.pdf)

a close cooperation between the fishing and processing sectors and (semi-) governmental research institutes.

### **Associations representing aquaculture producers and operators**

The two organisations, Dansk Fisk and Danmarks Fiskeindustriog Eksportforening (the Association of Danish Fish Processing Industries and Exporters) that represent the Danish fish processing industry have merged. The new organisation is called the Danish Seafood Association and represents around 100 processing and trading companies with combined exports worth Euro 2.14bn.

The new ten-member board of the Danish Seafood Association includes representatives from both, the Baltic and the North Sea, and Greenland like Rahbekfisk A/S, A. Espersen A/S, JP Klausen & Co. A/S, Kangamiut Seafood A/S, Brdr. Schlie's Fiskeeksport A/S, Royal Greenland A/S, Fonfisk Hanstholm A/S, Skagerakgroup A/S and Aker Seafoods Denmark A/S. Chairman of the board is Peter Bamburger, former chairman of Danmarks Fiskeindustriog Eksportforening. The director of the Association is Poul Melgaard, a former head of unit at Dansk Fisk.

Another association representing aquaculture producers is the Danish Association of Fish Meal and Fish-oil Producers.

In addition, as the one-stop-shop for sustainable aquaculture promotion within the Baltic Sea Region, members of the InnoAquaTech project have joined forces to form the Aquaculture Working Group of the SUBMARINER Network.

Together they will continue to address aquaculture practitioners, technology providers as well as other R&D partners through a set of dedicated activities.<sup>15</sup> One activity is to foster cross-sectoral interlinkage to actors from other blue bio-economy thematic fields, e.g. blue biotechnology, mussel farming, algae, multi-use of sea, and marine litter.

### **Aquaculture maintenance and monitoring**

The National Institute of Aquatic Resources (DTU Aqua) is scientifically advising the Ministry of Environment and Food of Denmark. This contract comprises monitoring of fisheries and fish and shellfish stocks, advising public authorities, the fishing industry and sector organizations, and research designed to support advisory and monitoring activities.

Moreover, DTU Aqua has in accordance with the EU Data Collection Framework a comprehensive monitoring and advisory contract with the Ministry of Environment and Food of Denmark. However, so far, the monitoring is not tackling the loss of gear but mainly farm effluents to reduce the amount of nutrients returning to the brook or river.

## **End of life**

### **Those dismantling the farm installation**

According to the Fisheries Act, the farmers have to leave the sea in the same condition like at the beginning, before installing the aquaculture plant. Therefore, they have to dismantle their farm installations by themselves while bearing the full costs. Some approaches to recycle parts

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<sup>15</sup> <https://www.submariner-network.eu/working-group-on-aquaculture>

oft he installations have started but are in their very beginning, without any pilot project level. Standardized decommissioning plans, like they exist for ships/vessels decommissioning do not exist in Denmark.

In the Baltic Sea, several beaches from Denmark and other Baltic States have been systematically monitored in 2012 - 2014 as part of the EU-funded project called "MARLIN".<sup>16</sup> The monitoring was done according to the UNEP guidelines on survey and monitoring of marine litter (UNEP 2009), although adapted to the Baltic Sea conditions. Based on these data, the Fishing-for-Litter initiative installed a programme for Danish fishers to collect waste and bring it back to port. During the last year, this programme has been extended (at a small scale and on voluntary basis) to aquaculture farmers, asking them to bring their debris back to the shore and fill it into containers. So far, this initiative has not been accepted very well within the aquaculture community due to open questions regarding the costs. So far, the farmers dismantle their plants by themselves, following the legal regulations and bearing the costs by themselves.

### **Those managing/governing the waste management**

For decommissioning, the Public Waste Agency of Denmark with their various municipal sub-branches are responsible for waste management. However, so far no integrated strategy for marine litter exists and all aquaculture waste has to be brought back to ports by the farmers themselves.

There, waste management plan exist, based on the Directive on port reception facilities for the delivery of waste from ships, amending Directive 2010/65/EU and repealing Directive 2000/59/EC. Offshore installations are one of the sea-based sources of marine litter. For that reason, Denmark has to adopt appropriate measures on waste delivery from offshore installations flying their flag or operating in their waters, or both, and ensure compliance with the stringent discharge norms applicable to offshore installations laid down in the MARPOL Convention.

### **Those processing the waste/ collection/ clean-up**

In Denmark, there is a waste collection and management sector with more than 50 companies<sup>17</sup>.

Presona is a pioneering Danish company active in circular economy. They are also dealing with rugged manufacturing, recycling and waste management environments and targeting a re-use rate of at least 50% of their waste by 2020, according to the EU Waste Directive.

Producers may also set up voluntary agreements with farmers to take back materials, however, this approach is not very settled yet.

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<sup>16</sup> <http://www.projectmarlin.eu/>

<sup>17</sup> <https://www.environmental-expert.com/companies/keyword-waste-management-272/location-denmark>