7 Marine aquaculture

Authors Daan Delbare[1], Nancy Nevejan[2], Margriet Drouillon[3], Peter Bossier[2], Thomas Verleye[4], Fien De Raedemaecker[4]

Lectors Karel Vanhulle[5], Lien Loosvelt[6], Senne Aertbeliën[7]

[1] Flanders Research Institute for Agriculture, Fisheries and Food (ILVO)
[2] University Ghent (UGent), Faculty of Bioscience Engineering, Department of Animal Sciences and Aquatic Ecology
[3] Ghent University (UGent), BLUEGent – Innovations in Aquaculture & Blue Life Sciences
[4] Flanders Marine Institute (VLIZ)
[5] Department of Agriculture and Fisheries, Fisheries service
[6] The Blue Cluster (DBC)
[7] FPS Health, Food Chain Safety and Environment, Directorate-General Environment, Marine Environment division

Delbare, D., Nevejan, N., Drouillon, M., Bossier, P., Verleye, T., De Raedemaecker, F. (2022). Marine aquaculture. In: Dauwe, S. et al. (Eds). Knowledge Guide Coast and Sea 2022 - Compendium for Coast and Sea. p. 123-138.

The term aquaculture covers the rearing or cultivation of aquatic organisms (in fresh, brackish or salt water) using techniques designed to increase the production of the organisms in question beyond the natural capacity of the environment, where the organisms remain the property of a natural or legal person throughout rearing and culture stage, up to and including harvesting (definition in Regulation (EU) 1380/2013). Mariculture, or marine aquaculture, is a specialised branch of aquaculture and includes the cultivation of organisms in a marine environment (FAO 2020). This definition comes from the Food and Agriculture Organisation of the United Nations (FAO) and is thus used in the FAO statistics (FAO Fisheries and Aquaculture Information and Statistics Service 2021). In addition, also aquaculture in areas adjacent to the sea (further referred to as aquaculture in the coastal zone) and land-based aquaculture of marine species are discussed within this thematic chapter.

In 2019, the worldwide aquatic production (through 'wild' fisheries and aquaculture, including macroalgae and other aquatic plants) amounted to 213.7 million tonnes. Aquaculture accounted for 56.2% (120.1 million tonnes) of the total production in 2019 (figure 1), compared to only 16.8% and 31.3% in 1990 and 2000, respectively. This makes aquaculture the fastest growing food production sector worldwide, with an average annual increase of 6.8% since 1990 (figure 1) (FAO Fisheries and Aquaculture Information and Statistics Service 2021).

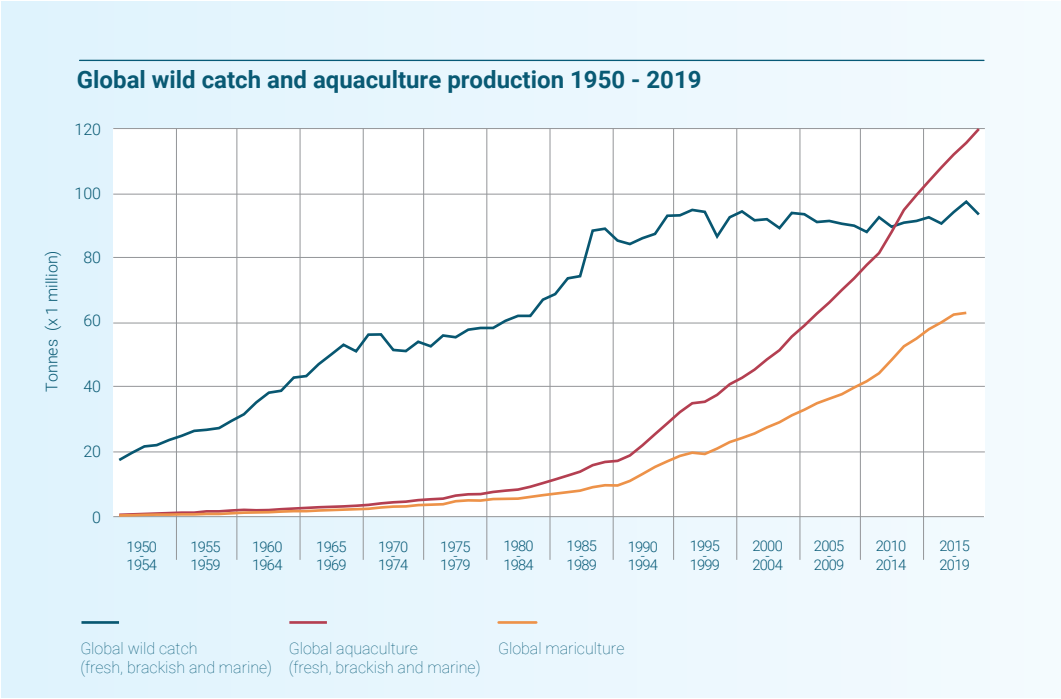

Figure 1. Global aquatic production (tonnes) through wild fisheries and aquaculture (fresh, brackish and marine) between 1950 and 2019 (Source: FAO Fisheries and Aquaculture Information and Statistics Service 2021).

Global mariculture production in 2019 amounted to 66.7 million tonnes, of which 34.6 million tonnes were macroalgae and other aquatic plants. This represents a total production value of 122 billion US dollars (FAO 2020). Europe produced a total of 2.7 million tonnes (4.1%) where the European Union (EU) accounted for only 0.9 million tonnes (1.3%). The main European mariculture producer is Norway (mainly salmon) with a total volume of 1.5 million tonnes, accounting for 53.6% of the European total. While the marine aquaculture production in the EU has stagnated over the past two decades (figure 2), Norway tripled its marine aquaculture production during the same period. The FAO did not record any commercial production of marine species in Belgium in 2019. The importance of freshwater aquaculture in Belgium was limited to a production volume of only 86 tonnes (figure 3) (FAO Fisheries and Aquaculture Information and Statistics Service 2021).

7.1 Policy context

At the European level, the policy concerning aquaculture (including mariculture) is conducted under the umbrella of the Common Fisheries Policy (CFP, Regulation (EU) 1380/2013). The European Commission, more specifically the Directorate-General for Maritime Affairs and Fisheries (DG MARE), coordinates policy and provides strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021-2030 (COM (2021) 236).

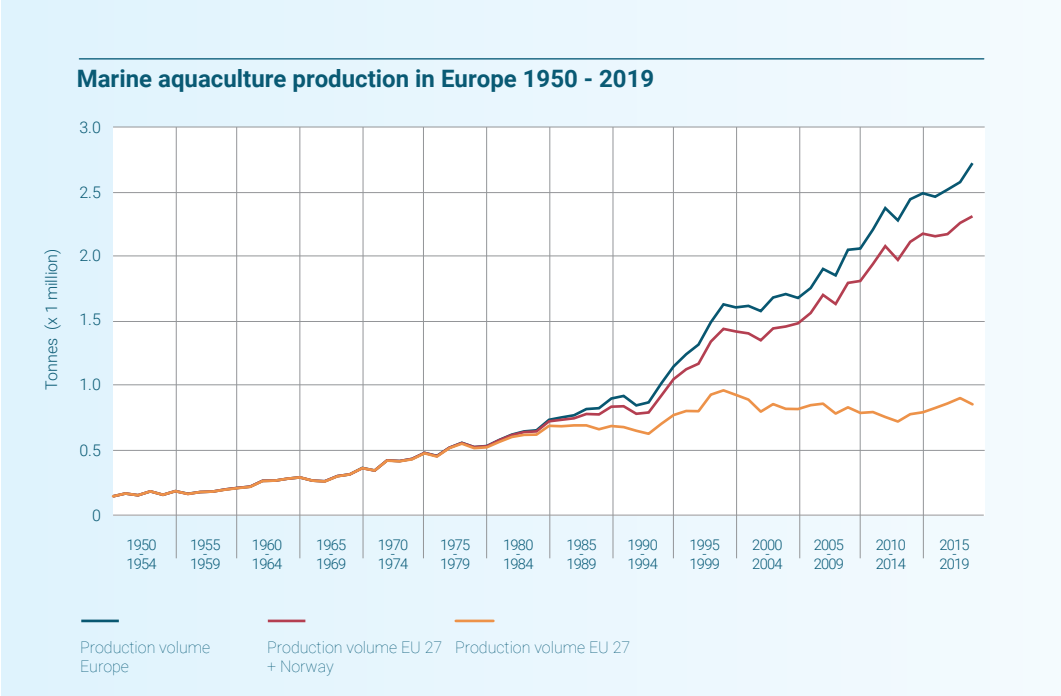

Figure 2. Marine aquaculture production (tonnes) in Europe and the European Union (EU) from 1950 to 2019 (Source: FAO Fisheries and Aquaculture Information and Statistics Service 2021).

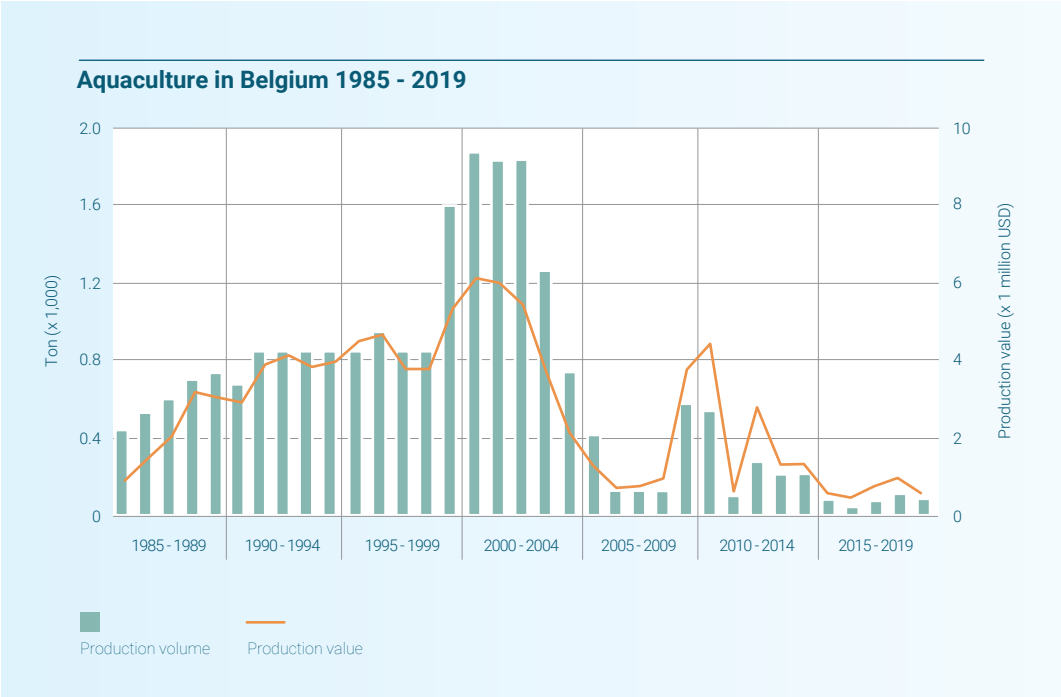

Figure 3. Annual aquaculture production (tonnes) and production value (USD) in Belgium between 1985 and 2019. The time series only include freshwater production as no commercial production of marine species has been recorded by FAO in the period under review (Source: FAO Fisheries and Aquaculture Information and Statistics Service 2021).

It focuses on the following objectives: (1) building resilience and competitiveness, (2) participating in the green transition, (3) ensuring social acceptance and consumer information and (4) increasing knowledge and innovation. An evaluation of the new strategic guidelines will be carried out by 2029, assessing their efficiency, effectiveness, coherence, relevance and EU added value. The farm-to-fork strategy COM (2020) 381 sets out a new approach to ensure that agriculture, fisheries, aquaculture and the entire food-value chain contribute appropriately to reducing

greenhouse gas emissions. Furthermore, sustainable aquaculture is one of the key objectives of the European Maritime and Fisheries Fund (EMFF, Regulation (EU) 508/2014) and the subsequent European Maritime, Fisheries and Aquaculture Fund (EMFAF, Regulation (EU) 2021/1139).

At the Belgian level, the granting of permits and the spatial planning of mariculture activities at sea (seaward side of the baseline) fall under the competence of the federal government (minister for the North Sea / FPS Public Health, Food Chain Safety and Environment). Aquaculture or mariculture infrastructures on Flemish territory (landward side of the baseline) are under the authority of the Government of Flanders. The Fisheries Service of the Policy Coordination and Environment Division (ABCO) of the Department of Agriculture and Fisheries is the managing authority of the Belgian Operational Programme for the implementation of the EMFF[1]. This Operational Programme for the Belgian Fisheries and Aquaculture Sector 2014-2020 includes measures to support aquaculture (summary brochure in Dutch only). These measures must be in line with the Belgian National Strategic Plan for Aquaculture (NSPA) (2014-2020). In order to better coordinate actions to promote aquaculture, EU member states are required to draw up a multi-annual strategic plan on the basis of the EU COM (2013) 229. In the mid-term revision of the plan in 2017, a significant extension was made to mariculture. A renewed Programme for the period 2021-2027 is expected in the course of 2022. Other regulations and competent authorities for mariculture and aquaculture infrastructures are presented on the website of the Flemish Aquaculture Platform.

7.2 Spatial use

7.2.1 Marine spatial planning and mariculture

The marine spatial plan (MSP 2020-2026, RD of 22 May 2019, see also Verhalle and Van de Velde 2020) for the Belgian part of the North Sea (BNS) provides the possibility for sustainable mariculture under strict conditions in both the operational wind farms (e.g. Belwind and C-Power) and in the newly demarcated zone for renewable energy (Princess Elisabeth zone) (figure 4). The wind farm concession holders must agree to the installation of mariculture activities (no longer the case for the Princess Elisabeth zone). Furthermore, the mariculture activities must reduce the level of eutrophication within the concession zone and the concession or licensing authority must, where appropriate, safeguard a control zone within the demarcated zone as a reference for the situation without aquaculture activities.

In addition to these zones specifically delineated for marine aquaculture, the MSP 2020-2026 provides an additional five zones for commercial and industrial activities (CIA zones). In these zones, sustainable aquaculture can also be developed alongside other activities, such as renewable energy generation, energy storage, desalination, etc. As stated in the MSP, such activities can only take place if strict conditions are met regarding safety, impact on sea view, impact on naturalness, multiple use of space and impact on other activities. The strategic location of these areas - closer to the coast - may improve the economic feasibility of sustainable aquaculture. On the other hand, the size of these zones is rather limited and there might be competition with other space users.

For commercial aquaculture activities in the sea areas under the jurisdiction of Belgium, a procedure must be followed to obtain an authorisation and permit (RD of 7 September 2003) (see also website of the Royal Belgian Institute of Natural Sciences - Operational Directorate Natural Environment (RBINS-OD Nature)). A permit for use can be obtained from the Marine Environment Service, DG Environment of the Federal Public Service for Public Health, Food Chain Safety and the Environment (procedure in the RD of 22 July 2019 and in the RD of 7 September 2003). For the environmental permit, the application must be accompanied by an environmental impact assessment (EIA) in accordance with the RD of 9 September 2003 covering the regulations on environmental impact assessment in application of the Marine Environment Law of 20 January 1999 (MMM Law, see also thematic chapter **Nature and environment**). Appendix 3 of the MSP 2020-2026 also indicates that a fisheries impact report should be drawn up in the environmental permit procedure for activities within the six nautical mile (nm) radius from the baseline that require a permit. Such an impact report should be drawn up according to the guidelines of the Management Unit of the Mathematical Model of the North Sea (MUMM) of the RBINS. For activities located in Natura 2000 areas, in accordance with the RD of 27 October 2016, a draft of the appropriate assessment (*passende beoordeling*) must be included in the application in order to assess the impact on the conservation objectives set for these Natura 2000 areas. An advice on the environmental permit and Natura 2000 authorisation is formulated by the RBINS-MUMM and sent to the federal minister responsible for the North Sea.

[1] Pending the approval of the Belgian Programme EMFAF 2021 - 2027 (expected in the course of 2022) and the update of the NSPA on the basis of the new strategic guidelines, the current NSPA is still in force. Given the transition period of the EMFF Operational Programme of three years, the objectives of the current NSPA have been formulated until 2023. Some current projects that are still receiving financial support under the EMFF Operational Programme will contribute to the objectives of the current NSPA until 2023.

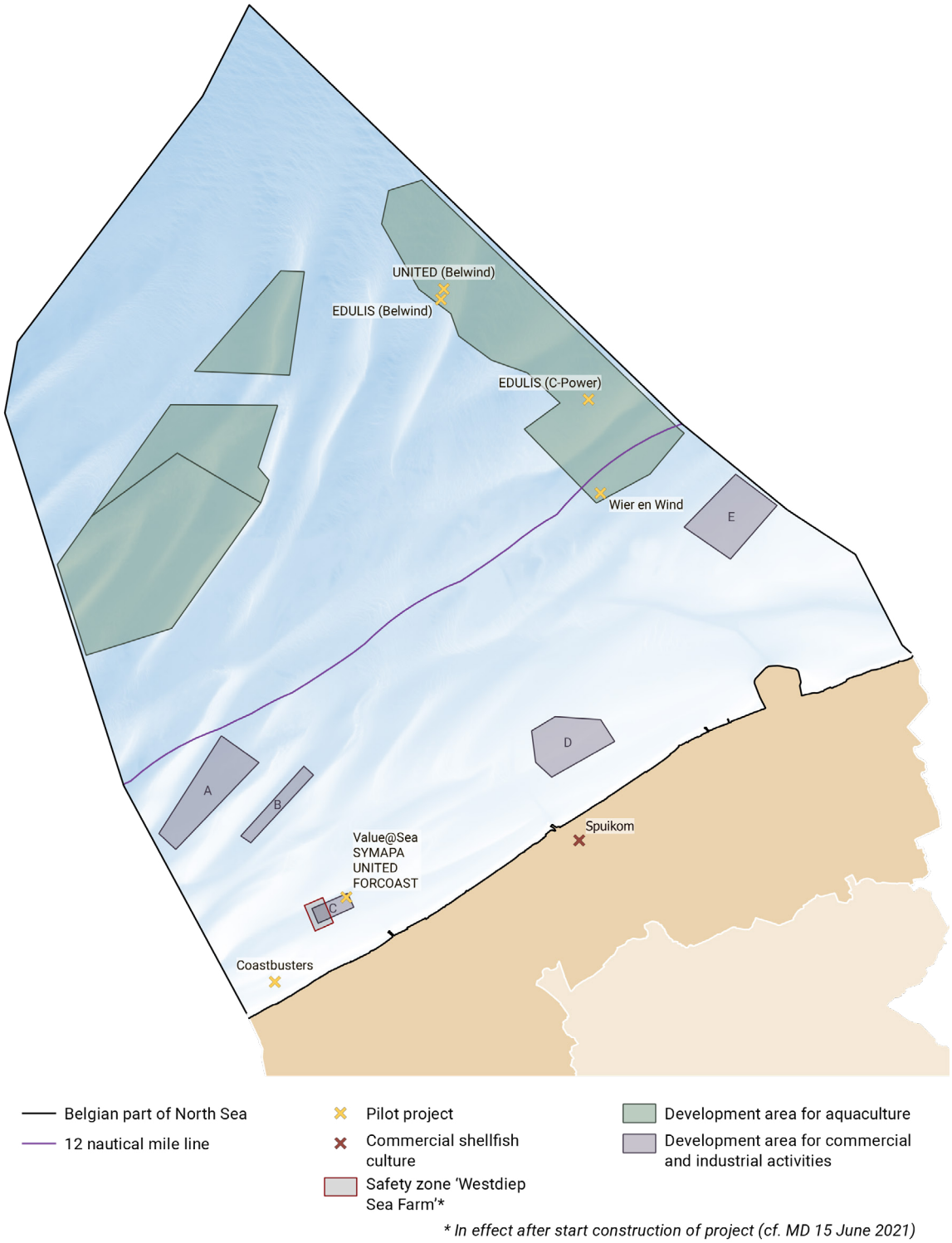

Figure 4. Sites reserved for aquaculture and for commercial and industrial activities in the BNS, including the location of pilot projects (Source: RBINS, MarineAtlas.be (based on the RD of 22 May 2019 (MSP 2020-2026)), Coastal Portal).

Aquaculture at sea involving the introduction of alien species, is subject to the additional procedure of the RD of 21 December 2001 on the protection of species in marine areas under Belgian jurisdiction. RBINS-MUMM is also the competent authority for the application of Regulation (EC) 708/2007 on the use of exotic and locally-absent species.

Shellfish culture must take place in designated production areas where the water quality, if necessary after an action programme, meets certain standards. For the North Sea, these standards have been set by the federal government, and for inland waters by the Government of Flanders. Zones for shellfish culture require special monitoring. The Sluice Dock of Ostend is the only inland waterbody recognised as a facility for shellfish production and therefore has the status of 'shellfish water' (Federal Agency for the safety of the Food Chain (FASFC)).

A coordinated spatial plan for mariculture is considered necessary at EU level (COM (2013) 229) to ensure the sustainable development and growth of aquaculture by reducing uncertainties, facilitating investments and addressing the lack of space. The compatibility of mariculture in the Belgian wind farms has already been investigated theoretically (see **7.5.3 Aquaculture research in Belgium**) and in practice (see **7.2.3 Pilot projects in the North Sea**). The added value of offshore mussel farming and the European market potential is also discussed in a report on the Blue Economy for Flanders (Bilsen et al. 2019).

7.2.2 Commercial aquaculture of marine species in Belgium

Commercial aquaculture in the Belgian coastal zone is currently limited to one commercial company, active in the Sluice Dock of Ostend. It involves the culture of both the flat oyster (*Ostrea edulis*) and the Pacific oyster (*Crassostrea gigas*) (see also Curé et al. 2000). The current aquaculture activities are distributed over two zones of respectively 3 and 4 ha (website Ostend Sluice Dock). The permits for the private use of public domain in the Sluice Dock for aquaculture are issued by the Coastal division of the Agency for Maritime Services and Coast (MDK). The environmental permit is granted by the Environment Department, who has an agreement with the FASFC concerning food chain safety. The Sluice Dock consultation platform coordinates the various Sluice Dock users by means of consensus and, based on this broadly supported consensus, formulates recommendations to the manager/owner, i.e. the Coastal division.

Late 2020, a commercial company acquired a user and environmental permit to develop a sea farm on a commercial scale in CIA zone C, better known as the *Westdiepzone*, at 5 km off the coast of Nieuwpoort and Koksijde (website sea farm)[2]. In total, this sea farm can cover an area of up to 4.5 km^2. A safety zone of 500 m around the first phase of the concession zone must be kept free from shipping from the day the construction phase will start (MB of 15 June 2021). In 2021, the company looked for partners for the installation and maintenance of the mussel lines, the cultivation and harvesting of Belgian mussels, and their processing and packaging. A first limited mussel harvest is expected by autumn 2022 followed by a full Belgian mussel season in 2023. At a later stage, the company also plans to cultivate oysters and seaweed.

Since July 2021, mussels from the *Bancs des Flanders*, harvested just across the French border through a partnership between a Belgian and a French company, have also been on the market (press release). Over the past two decades, a number of initiatives took place to cultivate mussels (*Mytilus edulis*) in the BNS, *inter alia* the 5b project *Vlaamse mosselkwekerij* (1998) and the PESCA project *Vlaamse mosselkweek* (2002). Between 2002 and 2006, offshore mussel cultivation experiments were carried out with private funding and scientifically supported by CLO-DVZ (now the Flanders Research Institute for Agriculture, Fisheries and Food (ILVO)). Independently of this private initiative, a FIFG project (Financial Instrument for Fisheries Guidance) on the commercialisation of Belgian offshore suspended mussel culture was conducted between 2005 and 2008 by the former Foundation for Sustainable Fisheries Development (SDVO). In this project, the production of mussels by means of suspended cultivation in cages, spread over five different areas, was executed and evaluated (Milieu-effectenbeoordeling Mosselcultuur 2005, Delbare 2005, Van Nieuwenhove 2008, ICES 2011). The permit for these areas was granted by the MD of 7 October 2005 following the environmental impact assessment (EIA) (cf. the Law of 20 January 1999 and the RDs of 7 and 9 September 2003). The MD of 8 July 2005 (repealed by the MB of 14 January 2020) provided for a simplified procedure and model form for the determination of the EIA. The cultivated mussels were marketed under the name *Flanders Queen Mussels* and *Belgica mussels*. For the first one, the supply volumes remained very limited and the activity ended in 2010. The commercial production of the *Belgica mussels* started in 2006. The maximum supply was 300 tonnes (2010 and 2011), but production was stopped in 2011. In both projects, the used mussel cages were technically not resistant to the harsh weather conditions in the BNS.

Land-based production of Atlantic salmon (*Salmo salar*) is planned by a Norwegian company, which is pursuing a research collaboration with Ostend Science Park, UGent and Inagro. A production department of 13.5 ha is planned to be established in the port of Ostend starting in 2021, where salmon will be farmed from egg to adult salmon in land-based tanks. From 2023-2024 onwards, a production of 15,000-20,000 tonnes of salmon is expected.

[2] Some parties, including the town of Nieuwpoort, appealed against both permits, but by the end of 2021 no decision had yet been reached.

A final initiative concerns the commercial cultivation of whiteleg shrimp (*Penaeus vannamei*) in land-based closed systems using bio-logging technology. Given the start-up phase and the low production volume to date (400 à 500 kg in 2020), these volumes are not yet recorded in FAO statistics.

7.2.3 Pilot projects in the North Sea

Figure 4 (see **7.2.1 Marine spatial planning and mariculture**) shows the locations reserved for aquaculture and for commercial and industrial activities in the BNS. Scientific pilot projects can also be started outside these areas provided that the necessary permits are obtained.

Given the potential for shellfish and seaweed cultivation in the BNS, as demonstrated by several studies (*Alver et al. 2015*), the 'North Sea Aquaculture' project was conducted during the period 2016-2019 with private, FIVA (Financial Instrument for the Flemish Fisheries and Aquaculture Sector) and EMFF funding. The research project had a threefold objective, namely to innovate cultivation techniques for shellfish and seaweed, to organise efficient use of space in the BNS and to develop a market for new regional marine products. The 'North Sea Aquaculture' project comprised two separate projects/test sites. The (1) Value@Sea project (2017-2019) near the coast of Nieuwpoort, which sought to test the technological, biological and economic feasibility of integrated cultivation of extractive aquaculture species[3]: the flat oyster, scallop (*Pecten maximus*) and sugar kelp (*Saccharina latissima*). The (2) EDULIS project (2016-2018) took place in the Belgian wind farms C-Power and Belwind and investigated the technological, biological and economic feasibility of mussel (*Mytilus edulis*) farming in offshore wind farms. The forces acting on the mussel longline were recorded through integrated force meters to model the movement of the mussel culture system with input from the prevailing currents and wave conditions (Pribadi et al. 2019). This allowed the minimum requirements for a mussel culture system to be determined and the system design to be optimised. Both projects identified the factors that have the greatest impact on the profitability of offshore mussel farming and coastal shellfish and seaweed farming (see press release EDULIS project).

The pilot projects Coastbusters (2016-2019) and Coastbusters 2.0 (2020-2022) off the coast of De Panne explored the use of innovative biostabilisation methods as a coastal defence mechanism, with the aim of achieving natural sand accretion and strengthening the foreshore against coastal erosion (see also thematic chapter **Safety against flooding**). Three concepts were tested, each with the potential to form a natural biogenic reef, namely the use of tubeworms (*Lanice conchilega*), sugar kelp and mussels (Sterckx et al. 2019, Coastbusters 2020, De Corte 2020a, Goedefroo 2020, Sterckx et al. 2020). These projects do not strictly involve aquaculture but use aquaculture techniques as part of nature-based coastal protection.

The Wier en Wind project (2019-2022) aims to realise a large-scale and automated seaweed cultivation system, which can be deployed within the North Sea wind farms. The research focuses on the development of a seaweed cultivation system that is reliable at sea, the testing of different substrates for seaweed attachment and the automation of harvesting.

The SYMAPA project (2019-2022) investigate the possible synergies between mariculture of mussels, flat oysters and seaweed, and passive fishing. With this experimental design, the possibilities of multiple use of space are studied.

The FORCOAST project (2019-2022) aims to provide information services regarding the sectors active in fisheries, bivalve mariculture and oyster grounds restoration. These services include high-resolution data on water quality, meteorological variables in the coastal area and satellite data. One of the pilots takes place in *Westdiep*, where a service module is being developed to determine the optimal timing to deploy oyster spat collectors. Since this service module makes use of sea currents, water temperature and chlorophyll a data, it can also be used for the larval distribution of oyster larvae from various breeding areas.

The UNITED project (2020-2023) promotes the multiple use of offshore space through the installation of demonstration projects, examining technical, regulatory, economic, social and environmental requirements and impacts. One of the pilots is located in Belgium and aims at investigating the development of aquaculture of the native flat oyster and sugar kelp in the Belwind offshore wind farm. Suspended culture systems, which are commercially viable and adapted to harsh conditions, will be used. The pre-operational phase to test the system will be conducted in the *Westdiep*. In addition, the potential of the erosion protection layer of wind turbines to serve

[3] In extractive aquaculture, the cultivated species are not fed, but instead obtain their nutrition (e.g. single-celled microalgae, phytoplankton and other nutrients) from the sea itself. Harvesting the shellfish and seaweeds removes nitrogen and phosphate from the ecosystem and reduces the risk of eutrophication.

as a reef for flat oysters where young hatchlings can settle is being evaluated. In the short term, aquaculture can supply the adults and hatchlings to support the restoration efforts, and in the long term, the developed oyster reefs can supply the aquaculture industry with local seed stock. The restoration of flat oyster reefs has not only become a Belgian, but also a European focus (Native Oyster Restoration Alliance). Seaweed, on the other hand, is cultivated both offshore and nearshore (*Westdiep*) in order to be able to compare nutritional and growth characteristics, sowing techniques and origins of plant material.

Besides these Flemish and European pilot projects at sea, with participation of Flemish/Belgian partners, numerous other research efforts offer a broad view of various aspects of mariculture in the BNS (see **7.5 Sustainable use**).

7.3 Societal interest

For 2018, a total of 12,389 aquaculture enterprises were reported in the EU under the Data Collection Framework (DCF) and the EU Multi-Annual Programme (EU-MAP), accounting for a total employment of 74,634 people or 39,931 full-time equivalents (FTE) (STECF 20-12 The EU Aquaculture Sector - Economic Report 2020). In total, the aquaculture industry produced 1.2 million tonnes in the 27 EU member states, with a turnover of 4.1 billion euro. Marine teleost fishes generated the highest turnover of 1.8 billion euro (45%), followed by shellfish (1.3 billion euro) (31%) and freshwater teleost fishes (1.0 billion euro) (25%). In terms of production volumes, the crustacean sector was the most important (54%), followed by marine teleost fishes (24%) and freshwater teleost fishes (22%) (STECF 20-12 The EU Aquaculture Sector - Economic Report 2020).

In Belgium, the importance of aquaculture production for human consumption is limited, and only 86 tonnes of freshwater species were produced in 2019 with a value of around 1.0 million euro (figure 3) (FAO Fisheries and Aquaculture Information and Statistics Service 2021). Until now, the core of the Belgian aquaculture industry was located in Wallonia, where mainly trout is farmed (an aquaculture branch not covered in this thematic chapter). A public register of all aquaculture companies in Belgium is published by the FASFC. As of 2021, Flanders is estimated to produce (slightly) more than Wallonia. The Flemish Aquaculture Platform lists about 36 Flemish companies, but these are not only producers. The list also includes specialised feed companies, distributors of aquaculture products and consultancy firms. The most important freshwater aquaculture products are the so-called omegabaars (jade perch, *Scortum barcoo*), pikeperch (*Sander lucioperca*) and caviar (e.g. Siberian sturgeon (*Acipenser baerii*), Russian sturgeon (*Acipenser gueldenstaedtii*), beluga (*Huso huso*) and starlet (*Acipenser ruthenus*)) (Van Bogaert et al. 2021). The producers are active in land-based aquaculture and use closed RAS systems (Recirculating Aquaculture Systems). Marine aquaculture in Belgium is rather limited for the time being. Oyster farming in the Sluice Dock of Ostend is the only commercial shellfish culture that takes place in the Belgian coastal zone. The whiteleg shrimp farm in Ternat is the only land-based aquaculture of marine species.

Belgian production accounts for only 0.01% of EU production (EUMOFA 2021). No separate figures are available for Flanders. Employment in the primary Belgian aquaculture sector was estimated at 60 FTE in 2014, while the supplying sector accounted for an additional 78 FTE (Platteau et al. 2014). No more recent figures are available.

Historically, the cultivation of flat oysters along our coast was of considerable commercial importance (Pirlet 2012). Especially the Ostend Oyster (*l'Ostendaise or Royal Ostendaise*) enjoyed worldwide fame. Shortly before the First World War, oyster farming reached its peak with 26 oyster parks along the Belgian coast. Annually, 30-35 million oysters were imported from England and further cultivated in the Belgian oyster pits (Halewyck and Hostyn 1978, Polk 2002). The two world wars and the increasing pollution of the sea caused a strong decrease in the number of oyster farms and finally resulted in the almost complete disappearance of domestic oyster breeding today. An overview of these activities can be consulted on the website of the history of Belgian oyster farming (2016).

7.4 Impact

The increasing demand for food and the competition for space and clean water has led to more fundamental research on how the ocean can feed a growing world population. Several publications point to the need for a shift from land-based and coastal aquaculture production to sustainable offshore production systems (Lovatelli et al. 2013, Kapetsky et al. 2013, Costello et al. 2020, Costello et al. 2021). This also highlights the importance of integrated multitrophic mariculture (IMTA) (e.g. Bollengier 2016, Blue Bioeconomy report 2020, Knowler et al. 2020) as a mitigation approach against the excess generation of nutrients and organic matter by intensive mariculture activities (e.g. Soto 2009, Report of the Global Conference on Aquaculture 2010 (FAO 2012), Sorgeloos 2013, Buck et al. 2017). By breeding species from lower trophic levels and optimising food and nutrition strategies, the

impact on the ecosystem is minimised and long-term sustainability is pursued (JRC 2016). Non-fed mariculture, including seaweed production, is currently highly underdeveloped in contrast to its benefits and biological and economic potential (Stuchtey 2020, Seaweed revolution 2020). Other recommendations related to offshore aquaculture, fish feed and aquaculture technologies were formulated in the Bremerhaven Declarations of 2012 (Part I, Part II) and 2013 (Part I, Part II). Furthermore, the FAO's Blue Growth initiative emphasises the three pillars of sustainable development - economic, environmental and social - so that fisheries and aquaculture contribute to the Sustainable Development Goals (SDGs) of the United Nation's 2030 Agenda (Achieving Blue Growth (FAO 2018)). The Scientific Advisory Report (EC) Food from the Oceans (2017) also provides a framework on how more food (biomass) can be extracted from the ocean in a sustainable way and also formulates some policy recommendations to this end. The report pursues aquaculture with a focus on lower trophic levels and identifies mariculture as the sector with the greatest potential to meet the growing food demand.

Other voices are more critical with respect to the scientific debate and their expectations of mariculture within the 'Blue Growth' policy discourse, and advocate the sustainable cultivation of freshwater organisms to meet the growing food demand (Belton et al 2020, van der Meer 2020).

Mariculture can - provided the right approach and strategy - provide several positive effects for the ecosystem and its users (e.g. FAO 2020, HLPE 2014, European Commission 2018). In addition to contributing to global food security, aquaculture offers potential benefits for public welfare, the economy and the environment, such as:

- Sustainable and locally produced food (Stentiford et al. 2020);
- Healthy food;
- Infrastructure and employment (including fish processing companies) (WorldFish 2015, Slater 2017, FAO 2020);
- Mariculture of extractive species can reduce nutrient pollution in coastal waters (Chopin and Tacon 2020) and thereby create a remedial potential for the higher trophic species;
- Mariculture can contribute to the protection of the coastline and stabilise coastal vegetation and sediments (Zhu et al. 2020, Gentry et al. 2019);
- Lower environmental impact and lower CO_2 emissions if mariculture were to replace land-based animal protein production (Costello et al. 2021);
- Seaweed can be a bioresource of high quality components for human consumption (Pycke and Faasse 2015, Pycke et al. 2018);
- Seaweed can be used as raw material for the production of non-food: bio-based materials (Groenendaal et al. 2021), bio-active components for cosmetics or pharmaceuticals, feed for farmed fish or cattle and biofuels (Buck et al. 2017) (see also **7.5.3.3 New valorisation routes**);
- Non-fed mariculture, such as shellfish and seaweed, can support wild fish species by creating artificial habitats and refuges (Theuerkauf et al. 2021, Alleway et al. 2019, Gentry et al. 2019).

Mariculture at sea can also have a number of undesirable effects on the environment and on the users of the sea, depending on the technique used and the organisms cultivated. The potential negative effects of mariculture (fish and shellfish) are extensively addressed in international publications such as OSPAR 2010, FAO 2012, European Commission 2012, Brenner et al. 2014 and FAO 2018. At a national level, this aspect is addressed in the Milieu-effectenbeoordeling Mosselcultuur (2005), De Wachter and Volckaert (2005) (GAUFRE project BELSPO), Goffin et al. (2007), the Strategische Milieubeoordeling van het Nationaal Operationeel Plan voor de Belgische Visserijsector 2014-2020 and the Milieueffectenrapport van de zeeboerderij Westdiep (2020).

Some of the potentially negative effects are:

- Modifications to the natural nutrient flux by, *inter alia*, excretion of organic nitrogen compounds;
- Input of nutrients and organic enrichment;
- Influx of pollutants, litter and hazardous substances (Sandra et al. 2020);
- Disturbance of the seabed;
- Changes in hydrological conditions;
- Introduction of non-indigenous species and spread of non-indigenous species by acting as 'stepping stones' in the rearing facility (see also Verleye et al. 2020);
- Spread of diseases and parasites between farmed and wild stocks;
- Genetic contamination of wild populations;
- Impact on marine mammals and fish that may become entangled in the nets or other aquaculture infrastructures;
- Large-scale cultivation of seaweed can cause nutrient deficiencies with negative effects on the entire food web (van der Meer 2020);
- Impact on other users due to parts of the installation coming loose, litter, increased shipping, etc.

7.5 Sustainable use

7.5.1 International and European developments

The EU strategy for Blue Growth (COM (2012) 494) identified aquaculture as a sector with the potential to stimulate economic growth and generate employment throughout Europe. In order to unlock the potential of aquaculture in the EU and overcome the stagnation, the communication COM (2013) 229 identified four priority areas. These guidelines were the main pillar of the strategic coordination of EU aquaculture policy in the period 2014-2020:

- Simplify administrative procedures;
- Securing sustainable development and growth of aquaculture through coordinated spatial planning;
- Enhancing the competitiveness of EU aquaculture;
- Promoting a level playing field for EU operators by exploiting their competitive advantages (e.g. strict environmental regulation, food safety, consumer protection, social legislation).

Communication COM (2021) 236 reviews the aforementioned strategic guidelines for the sustainable development of EU aquaculture. These guidelines are the main pillar of the strategic coordination of EU aquaculture policy in the period 2014-2020. This new communication paves the way for EU aquaculture to become a resilient and competitive reference sector that will set a global standard in terms of sustainability and quality. In communication COM (2020) 381, the EC stipulates an action plan for the sustainable exploitation of marine resources. Europe is also establishing regulations for an aquaculture-friendly environment to ensure the health of aquatic animals and the safety and quality of aquaculture products.

The CFP also aims to promote the aquaculture sector. The competitiveness of the EU should be strengthened by improving the organisation of markets and by making full use of the EMF(A)F (see also thematic chapter **Fisheries**) to draw up and implement production and marketing plans and to strengthen the links between research and development (R&D) and the aquaculture sector. Within the EMFF 2014-2020, 'Union Priority 2' aims to promote environmentally sustainable, resource-efficient, innovative, competitive and knowledge-based aquaculture. The 'Aquaculture Advisory Council', established in 2016 and consisting of representatives of the aquaculture industry and other stakeholders, will further strengthen this cooperation (Regulation (EU) 2015/242 and Regulation (EU) 2017/1575).

Additionally, the EC provides support to member states to address barriers (due to procedures and regulations) in order to avoid obstacles in the development of the sector. For example, in 2016 a document was published on the application of the Water Framework Directive (WFD, Directive 2000/60/EG) and the Marine Strategy Framework Directive (MSFD, Directive 2008/56/EG) in relation to aquaculture (European Commission 2016). Furthermore, Europe has produced guidance on the relationship between aquaculture and Natura 2000 sites (European Commission 2012). These guidelines should (1) provide a better understanding of conservation objectives, (2) promote good practice and (3) indicate how sustainable aquaculture and nature conservation can be compatible with each other.

Reducing marine litter is essential for the conservation and sustainable use of the oceans. On a global scale, little is known about the impact of aquaculture activities on the presence of marine and beach litter (FAO 2017, Huntington 2019, Sandra et al. 2020, Skirtun et al. 2021). On a European level, Directive 2019/904/EU requires member states to develop extended producer responsibility schemes for single-use plastic products for which no suitable and more sustainable alternatives are available. Besides, the European Parliament's (Chabaud 2021) advocates a systematic approach to tackle the impact of marine litter on the fisheries and aquaculture sector.

7.5.2 Federal and Flemish developments

At the Belgian level, mariculture activities have to comply with the Law of 22 April 1999 concerning the exclusive economic zone (EEZ) of Belgium in the North Sea and the Law of 20 January 1999 (MMM Law) relating to the protection of the marine environment and the organisation of marine spatial planning in the marine areas under Belgium's jurisdiction (see also thematic chapter **Nature and environment**). Several Implementing Decrees related to mariculture have been published under the MMM Law, such as the RD of 9 September 2003 on the environmental impact assessment, the RD of 7 September 2003 on the permit and authorisation procedure, the RD of 23 June 2010 on marine strategy and the RD of 23 June 2010 on achieving good surface water status. The RD of 18 May 2008 stipulates that an environmental impact assessment is required for the National Operational Plan regarding mariculture in marine areas under Belgian jurisdiction. A list of the Belgian/Flemish regulations to minimise the impact of aquaculture and mariculture facilities on the environment, is provided on the website of the Flemish Aquaculture Platform.

Like all EU member states, Belgium also has a national aquaculture strategy, in line with the non-binding strategic Union guidelines and as required by Art. 34 (2) of the CFP. This plan acts as the foundation for the realisation of Union priority 2 of the Operational Programme 2014-2020 (see also Department of Agriculture and Fisheries 2016). It aims to promote environmental sustainability, resource efficiency, innovation, competitiveness and knowledge-based aquaculture. The Operational Programme provides a SWOT analysis and an impetus to policy priorities for the Belgian aquaculture sector. With regard to this Union priority, Flanders wants to focus on the following objectives (Department of Agriculture and Fisheries 2016):

- Stimulate technological development, innovation and knowledge transfer;
- Promote competitiveness and viability of aquaculture companies, including the improvement of safety and working conditions;
- Protection and restoration of aquatic biodiversity and the promotion of aquaculture related ecosystems and resource efficient aquaculture;
- Promote aquaculture with a high level of environmental protection, animal welfare and health, public health and safety;
- Development of professional training and skills.

In preparation for the publication of the new European strategic guidelines for aquaculture (2021-2030) and the new EMFAF Regulation (2021-2027), the necessary preparations were made in Flanders and Wallonia in 2020 to update the National Strategic Plan for Aquaculture (NSPA 2017). The renewed NSPA for the period 2021-2030 will be published in the course of 2022, after approval of the included measures that are also reflected in the EMFAF programme (2021-2027). The NSPA describes, on the one hand, the common strands between the Flemish and Walloon regions and, on the other hand, discusses in more detail the regional points of interest.

The Coalition Agreement from the Flemish Government 2019-2024 and the Policy brief Agriculture and Fisheries 2019-2024 clearly state that aquaculture is a promising sector for Flanders and advocate active support to develop a strong, innovative and sustainable Flemish aquaculture sector. Furthermore, the Flemish Parliament developed a proposition for a resolution on the development of sustainable and integrated aquatic and mariculture in Flanders (2021) advocating for a continuation of policy embedding of this sector with concrete proposals in the area of:

- General and legislation-related matters;
- Knowledge, research, sharing of expertise and practice-oriented;
- Innovation, profitability and support for companies.

The Flemish Aquaculture Platform aims to stimulate and facilitate the development of the Flemish aquaculture sector, outlines the aquaculture landscape (trends and developments) in Flanders and acts as the information channel on aquaculture for entrepreneurs and researchers. In 2012, the Strategic Aquaculture Steering Group (SSAQ) was established under the framework of the Flemish Aquaculture Platform. This steering group brings together all levels of the aquaculture sector to further develop and adjust strategic choices where needed. Furthermore, it provides an aquaculture consultant to guide concrete projects and to promote networking. At the Flemish level, a bottleneck analysis and recommendations to facilitate sector development were published by the Court of Audit: Aquacultuur in Vlaanderen (2013). Through a participatory trajectory in 2021, coordinated by the Blue Cluster, the bottlenecks, needs and recommendations concerning the legislation and regulations on the Flemish and federal level were identified in order to realise a local, sustainable and innovative growth of mariculture (Blue Cluster 2021).

In cooperation with the Flemish aquaculture sector, the impact of aquaculture on marine litter is being mapped and possible remedial measures are being developed and applied. This is included in measure 13 of the Flanders Integrated Action Plan on Marine Litter (OVAM 2017).

7.5.3 Aquaculture research in Belgium

Several (scientific) institutions and companies conduct research on the sustainable development of aquaculture in Flanders and the BNS (see Flemish Aquaculture Platform). The research projects on marine aquaculture can be divided into four themes: (1) optimisation of the (local) supply chain, (2) innovation in production systems, (3) new valorisation routes and (4) land-based aquaculture. This division runs partly in parallel with the roadmap on sea food and marine biotechnology of the Blue Cluster (DBC). This spearhead cluster of the Government of Flanders focuses on a sustainable and innovative Blue Economy, and has developed this roadmap with the objective of increasing the consumption of locally produced marine food and fulfilling the potential of marine biorefinery.

7.5.3.1 Optimisation of the (local) supply chain

Research on the optimisation of the (local) supply chain is essential to guarantee local stocks of breeding and hatching material with a view to monitoring safety, quality and volumes. At present, there is no local hatchery material available in Flanders for the supply to aquaculture installations at sea. The projects in table 1 focus on research on the optimisation of the (local) supply chain.

Table 1. Past and current aquaculture projects, with participation of a Belgian partner, on the optimisation of the (local) supply chain.

Project and duration	Description
Aquavlan (2009-2014)	This project aimed at building the foundations for an economically, socially and ecologically sustainable aquaculture sector in the Flemish-Dutch border region. The project focused specifically on the sustainable farming of shellfish, fishes and the cultivation of saline vegetables.
Aquavlan2 (2016-2019)	This follow-up initiative supported companies in the aquaculture and greenhouse horticulture sectors with technical innovation.
BlueMarine³.com (2019-2022)	This project focuses on improving knowledge on hatchery technology for different species groups (seaweed, molluscs and crustaceans). Innovation is actively pursued for both biological and technological aspects, with a strong emphasis on the integrated multi-species approach, i.e. developing synergies and integration between species, infrastructure, breeding techniques and management.

7.5.3.2 Innovation in production systems

Innovation in production systems includes research on the multiple use of space, Aquaculture 4.0 and sustainable seeding and harvesting systems. The integration of aquaculture with other offshore activities is a research topic that received already quite some attention in the past. The use of innovative materials, technologies and data management in aquaculture is called Aquaculture 4.0. This technological revolution is necessary to improve efficiency and performance and increase sustainability in an environment subject to climate change (García-Poza et al. 2020). The implementation of methods or technologies for more sustainable and efficient harvesting of biomass is an area of research that is receiving increasing attention. The projects in table 2 focus on the above research themes.

Table 2. Past and current aquaculture projects, with participation of a Belgian partner, on the innovation in production systems.

Project and duration	Description
MARIPAS (2009-2010)	This project investigated the multi use of mariculture and offshore wind farms (Verhaeghe et al. 2011 and Alver et al. 2015).
AquaValue (2014-2015)	This project developed a roadmap for aquaculture in Flanders and investigated the integration of aquaculture with other offshore activities. Four pilot projects were launched providing a strong stimulus for the development of a sustainable, integrated aquaculture sector in Flanders. These projects formed the basis for a number of concrete follow-up projects that have been implemented at sea and on land (Value@Sea, EDULIS, Coastbusters and BlueMarine³.com).
PERSUADE (BELSPO) (2017-2021)	The focus of this project was on the functioning of the coastal ecosystem under the influence of the combination of both local and global stressors, including the operation of wind farms and mussel farming.
MPVAQUA (2019-2022)	The industrial research project focuses on innovative marine floating photovoltaic (MFPV) technologies for offshore electricity production in a harsh marine environment, possibly in synergy with aquaculture.
D4PV@Sea (2019-2020)	A toolbox was developed within this project for the assessment and integration of social and spatial risks of multifunctional marine infrastructure.
BIOGEARS (2019-2022)	Within this project, bio-based and biodegradable ropes are being developed in collaboration with a Belgian partner for European aquaculture. Besides the technical evaluation of the ropes for seaweed and mussel cultures, attention is also paid to sustainability and economic feasibility.
AlgaeDemo (2019-2021)	The project aims to demonstrate the sustainable, large-scale industrial cultivation of selected seaweed species in the open sea, equipped with automatic seeding, harvesting and monitoring systems.

Project and duration (continuation)	Description
AQUA-LIT (2019-2021)	The project has developed a toolbox of innovative ideas and methodologies at the European level (Vidal et al. 2020) to prevent litter from aquaculture activities. This project provides the necessary knowledge base on the identification of litter items that can be associated with aquaculture activities (Sandra et al. 2020) and stakeholder recommendations (De Raedemaecker et al. 2020) in order to design concrete policy measures (Devriese et al. 2019, Hipolito et al. 2020).
MARCOS (2020-2021)	This project investigated the potential of large-scale offshore aquaculture (LSOA) and its wave attenuation effect.

7.5.3.3 New valorisation routes

The research into new valorisation routes for marine species will also have an impact on mariculture developments in the longer term. A first step in this respect is the screening of marine species for valorisable components for high-value applications. The development of refining processes and production schemes and the marketing of marine products are also linked to this. Table 3 summarises the projects investigating these themes.

Table 3. Past and current aquaculture projects, with participation of a Belgian partner, on new valorisation routes.

Project and duration	Description
EnAlgae (2011-2015)	Within this project, a network of pilot installations for the cultivation of microalgae was built to investigate the valorisation potential as biomass for renewable fuel.
De Blauwe Keten (2015-2018)	The project focused on the development of a complete chain, from cultivation to market product, for the saltwater alga *Spirulina*.
SeaConomy (2016-2018)	The economic feasibility of local seaweed farming was studied in the desktop project of a multidisciplinary consortium of companies, sector organisations and government agencies (Pycke et al. 2018).
Blueshell (2017-2019)	The project investigated bioactive substances from shellfish for applications as food additives and growth promoters in strawberry cultivation. Residue streams from existing aquaculture productions may be valorised through this research scope.
Zeebes (2017-2019)	This project conducted research into the presence of interesting bioactive substances in shellfish for pharmaceutical and nutraceutical applications. In addition, the project also investigated a pilot process for the (re)production of tunicates as well as the technology and analyses for obtaining an economically feasible process of processing and drying these organisms for bulk applications in aquaculture feeds.
Study on growth conditions of European seaweeds (2018-2019)	This study on growth conditions of European seaweeds in the context of aquaculture created habitat suitability maps for a selection of European seaweed species based on ecological modelling (Westmeijer et al. 2019). Species-specific growth was quantified as a function of temperature, salinity, light and nutrients. In addition to identifying regions with favourable growth conditions for seaweed cultivation, climate scenarios were considered to assess how these regions will evolve in the future.
ValgOrize (2019-2021)	The project investigated the valorisation of seaweed and microalgae as food for the European market.
PROBIO (2019-2022)	The project focuses on bioprospecting and characterisation of bioactive substances originating from local North Sea species. Through a value chain approach, the project aims to simultaneously stimulate new applications and markets for aquaculture, biorefinery and biotechnology.
EffSep (2019-2024)	The project also focuses on the valorisation of by-products and aims to acquire knowledge on biomass stabilisation and extraction of macro-components (proteins, polysaccharides and lipids) from different types of biomass (including microalgae) while maintaining the functionality of these macro-components.

7.5.3.4 Land-based aquaculture

Land-based aquaculture of marine species is being investigated for the brown shrimp (*Crangon crangon*), as there is a niche market for live or large specimens of this species (Delbare et al. 2015). Research on other marine species on land has also gained interest in recent years (table 4).

Table 4. Past and current aquaculture projects, with participation of a Belgian partner, on land-based aquaculture.

Project and duration	Description
Shrimpbreed (2020-2022)	The project investigates the scaling-up of hatchery techniques and system development for farming to commercial product in so-called Shallow Raceway Systems, as well as the economic feasibility and marketing of live brown shrimp.
BioRAS kaviaar (2020-2023)	The project wants to develop, optimise and validate the integrated cultivation of the whiteleg shrimp (*P. vannamei*) and the macroalgae *Caulerpa lentillifera* (also called green caviar) in combination with a smart monitoring system. This will be examined both in a recirculation system (RAS) and an organic flocculation system.
SEACROPS (2021-2022)	This project aims to optimise the land-based large-scale cultivation of macroalgae.

Legislation reference list

Overview of the relevant legislation on European, federal and Flemish level. For the consolidated European policy context see Eurlex. The national legislation can be consulted on the Belgian official journal and the Justel-database, the Flemish legislation is available on the Flemish Codex.

European legislation and policy context			
Document number	**Title**	**Year**	**Number**
Communications			
COM (2007) 575	Communication from the Commission: An Integrated Maritime Policy for the European Union	2007	575
COM (2012) 494	Communication from the Commission: Blue Growth - opportunities for marine and maritime sustainable growth	2012	494
COM (2013) 229	Communication from the Commission: Strategic Guidelines for the sustainable development of EU aquaculture	2013	229
COM (2020) 380	Communication from the Commission: EU Biodiversity Strategy for 2030 - Bringing nature back into our lives	2020	380
COM (2020) 381	Communication from the Commission: A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system	2020	381
COM (2021) 236	Communication from the Commission: Strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021 to 2030	2021	236
Directives			
Directive 91/676/EEC	Directive concerning the protection of waters against pollution caused by nitrates from agricultural sources (Nitrate Directive)	1991	676
Directive 92/43/EEC	Directive on the conservation of natural habitats and of wild flora and fauna (Habitats Directive)	1992	43
Directive 2000/60/EC	Directive establishing a framework for community action in the field or water policy (Water Framework Directive)	2000	60
Directive 2008/56/EC	Directive establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)	2008	56
Directive 2009/147/EC	Directive on the conservation of wild birds (Birds Directive)	2009	147
Directive 2010/75/EU	Directive on industrial emissions (integrated pollution prevention and control)	2010	75
Directive (EU) 2019/904	Directive on the reduction of the impact of certain plastic products on the environment	2019	904
Regulations			
Regulation (EC) 708/2007	Regulation concerning use of alien and locally absent species in aquaculture	2007	708
Regulation (EC) 762/2008	Regulation on the submission by Member States of statistics on aquaculture and repealing Council Regulation (EC) No 788/96	2008	762
Regulation (EU) 1380/2013	Regulation on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC (Common Fisheries Policy)	2013	1380
Regulation (EU) 508/2014	Regulation on the European Maritime and Fisheries Fund and repealing Council Regulations (EC) No 2328/2003, (EC) No 861/2006, (EC) No 1198/2006 and (EC) No 791/2007 and Regulation (EU) No 1255/2011 of the European Parliament and of the Council (EMFF Regulation)	2014	508
Delegated Regulation (EU) 2015/242	Commission Delegated Regulation laying down detailed rules on the functioning of the Advisory Councils under the Common Fisheries Policy	2015	242
Regulation (EU) 2016/429	Regulation on transmissible animal diseases and amending and repealing certain acts in the area of animal health ('Animal Health Law')	2016	429

European legislation and policy context (continuation)			
Document number	**Title**	**Year**	**Number**
Regulation (EU) 2021/1060	Regulation laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund, the Just Transition Fund and the European Maritime, Fisheries and Aquaculture Fund and financial rules for those and for the Asylum, Migration and Integration Fund, the Internal Security Fund and the Instrument for Financial Support for Border Management and Visa Policy	2021	1060
Regulation (EU) 1139/2021	Regulation establishing the European Maritime, Fisheries and Aquaculture Fund and amending Regulation (EU) 2017/1004	2021	1139

Belgian and Flemish legislation		
Dates	**Title**	**File number**
Royal Decrees		
RD of 21 December 2001	Koninklijk besluit betreffende de soortenbescherming in de zeegebieden onder de rechtsbevoegdheid van België	2001-12-21/72
RD of 7 September 2003	Koninklijk besluit houdende de procedure tot vergunning en machtiging van bepaalde activiteiten in de zeegebieden onder de rechtsbevoegdheid van België	2003-09-07/32
RD of 9 September 2003	Koninklijk besluit houdende de regels betreffende de milieu-effectenbeoordeling in toepassing van de wet van 20 januari 1999 ter bescherming van het mariene-milieu in de zeegebieden onder de rechtsbevoegdheid van België	2003-09-09/30
RD of 18 May 2008	Koninklijk besluit tot vaststelling van het feit dat een beoordeling van de gevolgen op het milieu vereist is voor het nationaal operationeel programma voor de visserijsector en dat een beoordeling van de gevolgen op het milieu niet vereist is voor het nationaal strategisch plan voor de visserijsector	2008-05-18/32
RD of 23 June 2010	Koninklijk besluit betreffende de vaststelling van een kader voor het bereiken van een goede oppervlaktewatertoestand	2010-06-23/04
RD of 23 June 2010	Koninklijk besluit betreffende de mariene strategie voor de Belgische zeegebieden	2010-06-23/05
RD of 22 May 2019	Koninklijk besluit tot vaststelling van het marien ruimtelijk plan voor de periode van 2020 tot 2026 in de Belgische zeegebieden	2019-05-22/23
RD of 22 July 2019	Koninklijk besluit tot vaststelling van de procedure tot het bekomen van een gebruiksvergunning voor de zones voor commerciële en industriële activiteiten in de zeegebieden onder de rechtsbevoegdheid van België	2019-07-22/17
Ministerial Decrees		
MD of 7 October 2005	Ministerieel besluit houdende verlening aan de AG haven Oostende van een vergunning voor de productie van tweekleppige weekdieren door middel van hangstructuren in de zones Z1, Z2, Z3 en Z4 in de zeegebieden onder rechtsbevoegdheid van België	
MD of 14 January 2020	Ministerieel besluit tot opheffing van ministeriële besluiten betreffende de vereenvoudigde procedure voor opstellen van het milieu-effectenrapport	2020-01-14/02
MD of 15 June 2021	Ministerieel besluit tot instelling van een veiligheidszone rond de zeeboerderij	2021-06-15/02
Laws		
Law of 20 January 1999	Wet ter bescherming van het mariene milieu en ter organisatie van de mariene ruimtelijke planning in de zeegebieden onder de rechtsbevoegdheid van België	1999-01-20/33
Law of 22 April 1999	Wet betreffende de exclusieve zone van België in de Noordzee	1999-04-22/47