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COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021 to 2030

{SWD(2021) 102 final}

1. THE NEED FOR A NEW EU STRATEGY FOR AQUACULTURE

The European Green Deal and the Farm to Fork Strategy underline the potential of farmed seafood as a source of protein for food and feed with a low-carbon footprint which has an important role to play in helping to build a sustainable food system. The Farm to Fork Strategy also sets specific targets for aquaculture, in particular the reduction of sales of antimicrobials[1] and a significant increase in organic aquaculture[2].

Aquaculture creates jobs and economic development opportunities in the EU's coastal and rural communities. This sector can also help: decarbonise the economy; fight climate change and mitigate its impact; reduce pollution; contribute to better preserving ecosystems (in line with the objectives of the Biodiversity strategy and the Zero-pollution ambition for a toxic-free environment); and be part of a more circular management of resources. A strategic and long-term approach for the sustainable growth of EU aquaculture is therefore more relevant today than ever. This approach should also set the path for the recovery of the EU aquaculture sector in the aftermath of the COVID-19 crisis, and ensure its longer-term sustainability and resilience.

The Common Fisheries Policy Regulation[3] already called for a coordinated EU strategic approach to support the growth of the EU aquaculture sector while ensuring its economic, environmental and social sustainability. Despite of progress made thanks to the "Open Method of Coordination" laid down by the Regulation as well as EU funding, the aquaculture sector is still far from reaching its full potential in terms of growth and meeting the increasing demand for more sustainable seafood[4]. The EU imports over 70% of the seafood that it consumes[5]. Aquaculture products overall (including imports) represent 25% of EU consumption of seafood, while EU aquaculture products represent only 10% of EU consumption. EU aquaculture accounts for less than 2% of global aquaculture production. EU Aquaculture production remains highly concentrated in terms of both EU Member States and species farmed, so there is significant potential for diversification. Aquaculture in the EU, when compared to aquaculture in other countries, is subject to some of the strictest regulatory requirements for quality, health and the environment. But even so, EU aquaculture can still further improve its environmental performance, and thereby contribute to the objectives of the European Green Deal and related strategies.

This Communication reviews the Commission's Strategic Guidelines for the sustainable development of EU aquaculture adopted in 2013[6]. These guidelines have been the main

[1] According to the Farm to Fork Strategy, the Commission will 'take action to reduce overall EU sales of antimicrobials for farmed animals and in aquaculture by 50% by 2030'.
[2] The Farm to Fork Strategy sets the objective of having 'at least 25% of the EU's agricultural land under organic farming by 2030 and a significant increase in organic aquaculture'.
[3] Regulation (EU) No 1380/2013.
[4] A detailed analysis of the economic performance of the EU aquaculture sector produced by the Scientific, Technical and Economic Committee for Fisheries (STECF) STECF can be consulted at https://stecf.jrc.ec.europa.eu/reports/economic.
[5] If we consider exports of EU fisheries and aquaculture products, according to the 2020 report on the EU Fish Market of the European Market Observatory for Fisheries and Aquaculture Products (EUMOFA), the self-sufficiency rate for fisheries and aquaculture products was about 42% in 2018. Self-sufficiency is defined as the capacity of EU Member States to meet demand from their own production, and can be calculated as the ratio of domestic production over domestic consumption.
[6] COM (2013)229 final of 29.4.2013.

pillar of the strategic coordination of aquaculture policy in the EU. By 2015, on the basis of these guidelines, EU Member States adopted Multi-annual National Strategic Plans (MNSPs) for aquaculture. The implementation of these MNSPs was supported by the exchange of good practices among EU Member States facilitated by the Commission and funding through the European Maritime and Fisheries Fund (EMFF) and other EU funds.
The Commission has invited EU Member States to review their MNSPs taking into consideration consultations on the new guidelines laid down in this Communication. The future European Maritime Fisheries and Aquaculture Fund[7] (EMFAF) will continue to provide support to EU Member States to help implement the strategic vision for the sector, as reflected in those MNSPs and their Operational Programmes, including through local actions[8].

2. THE NEW STRATEGIC GUIDELINES

The European Green Deal is the EU's new growth strategy and aims at stimulating the economy and creating jobs while accelerating the green transition in a cost-efficient way. The strategic guidelines laid down in this Communication aim to offer a common vision for EU Member States and all relevant stakeholders for the further development of aquaculture in the EU in a way that contributes to that growth strategy. In particular , these guidelines aim to help building an EU aquaculture sector that: (i) is competitive and resilient; (ii) ensures the supply of nutritious and healthy food; (iii) reduces the EU's dependency on seafood imports; (iv) creates economic opportunities and jobs; and (v) becomes a global reference for sustainability. They should also help EU consumers make informed choices of sustainable aquaculture products and to ensure a level playing field for aquaculture products marketed in the EU. These guidelines should also help guide the use of the many instruments and funds available to support EU aquaculture, as well as to support the implementation of applicable EU legislation.

Achieving this vision will require addressing different challenges and opportunities of the EU aquaculture sector in order to reach the following inter-related 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.

This Communication provides general guidelines on addressing those challenges and opportunities. The annex to this Communication also proposes specific actions by the

[7] The text of the political agreement on the proposal for the Regulation on the EMFAF is available in this website:
https://www.europarl.europa.eu/meetdocs/2014_2019/plmrep/COMMITTEES/PECH/DV/2021/02-22/EMFAF_consolidated_clean_EN.pdf. This text is pending a legal revision and the final adoption by the Council and the European Parliament.
[8] According article 23 of EMFAF Regulation (text of the political agreement, cf. footnote 7), support to aquaculture under the EMFAF shall be consistent with the multiannual national strategic plans for the development of aquaculture.

Commission, the EU Member States and the Aquaculture Advisory Council to make progress in all the areas identified.

Whenever necessary, this Communication will make reference to specific challenges and opportunities in shellfish farming[9] and inland aquaculture[10] due to their specific characteristics. As a follow-up to the Farm to Fork Strategy, the Commission is also working on a separate and specific initiative to support the production, safe consumption and innovative use of algae. This initiative will address the challenges and opportunities of algae farming and propose concrete actions[11].

This Communication has been prepared in close consultation with EU Member States and stakeholders, notably those represented in the Aquaculture Advisory Council. It also takes into account the results of a public consultation[12]. In addition, this Communication takes into consideration the views expressed by the European Parliament on the development of EU aquaculture[13].

2.1. Building resilience and competitiveness

There are two key enabling conditions for the EU aquaculture sector to grow as a resilient and competitive sector: access to space and water; and a regulatory and administrative framework that is transparent and efficient. The interim evaluation of the Open Method of Coordination[14] concluded that, despite the progress made in some Member States since the adoption of the 2013 strategic guidelines, further efforts are necessary in both these areas. On resilience, two issues pose a particular challenge to the aquaculture sector: the management of risks related to animal and human health (notably but not exclusively in mollusc farming), and the impact of climate change. For freshwater aquaculture in particular, predators and drought[15] pose also a challenge in

[9] The production of shellfish in the EU relies mostly on molluscs, namely mussels, oysters and clams. Mollusc farming in the EU is mostly a traditional, family-based, and labour-intensive aquaculture activity that is fully integrated in the local landscape.

[10] Inland aquaculture is a particularly suitable tool for producing sustainable food in landlocked regions, and also provides much-needed jobs. In the EU, some of the major freshwater species include common carp, rainbow trout and emerging species such as catfish and pikeperch. Earthen ponds remain the most commonly used production facility, but raceways and other flowing water systems, cages, pens and tanks are also widely used. Some types of freshwater aquaculture (especially pond aquaculture) can provide ecosystem services if they are well managed, and are often linked to culture and tradition. Water re-use systems (recirculating aquaculture systems) are used less frequently due to the high level of investment required, but they are likely to become more common in the future due to their clear benefits.

[11] According to the Farm to Fork Strategy, the Commission will 'set out well-targeted support for the algae industry, as algae should become an important source of alternative protein for a sustainable food system and global food security'.

[12] A public consultation was held between July and October 2020. These new strategic guidelines also take into consideration the results of the interim evaluation of the Open Method of Coordination (see staff working document: https://ec.europa.eu/fisheries/sites/fisheries/files/docs/swd-2020-6_en.pdf), experience exchanged in the context of the open method of coordination and results of EU-funded projects.

[13] European Parliament resolution of 12 June 2018, 'Towards a sustainable and competitive European aquaculture sector: current status and future challenges' (2017/2118(INI)).

[14] Cf. footnote 121.

[15] Drought can endanger the viability of freshwater farms, which, unlike agriculture farms, do not always count on compensations for this kind of situation.

terms of profitability[16]. Producer and market organisation, as well as control and combatting fraud, are also important tools to ensure the resilience and competitiveness of the EU aquaculture sector. Finally, the sector can also be made more competitive by further diversifying EU aquaculture production and adding value to aquaculture products.

2.1.1. Access to space and water

Water is becoming scarce due to climate change. There is also increasing competition for both space and access to water among different economic activities, including aquaculture. Coordinated spatial planning, with the early involvement of relevant stakeholders, is therefore essential. This spatial planning can ensure the allocation of space and water among different activities, while preserving ecosystems. EU Member States have already made some progress in integrating aquaculture activities in their maritime spatial plans, in line with the Maritime Spatial Planning Directive[17]. However, many of these plans are only about to enter into force, and their results for aquaculture mostly remain to be seen. Moreover, further progress is needed in other aspects of the planning for space and access to water for aquaculture activities.

Coordinated spatial planning should encompass not only marine aquaculture, including transitional (brackish) waters, but also freshwater as well as land-based aquaculture (Recirculating Aquaculture Systems, RAS). It should also anticipate the development of offshore aquaculture, where natural conditions allow[18]. Special attention should be given to the development of aquaculture with a lower environmental impact (such as combining certain types of farming to further reduce the emissions of nutrients and organic matter into the environment), and the integration of suitable aquaculture activities (notably those offering ecosystem services) into protected areas such as Natura2000 areas. Spatial planning should always ensure the implementation of relevant EU legislation, and make available special areas for organic aquaculture and the production of molluscs[19]. Planning should also take into account the adaptation of aquaculture to climate change, as well as the potential of certain types of aquaculture to mitigate the impact of climate change (e.g. carbon capture or preservation of ecosystems that provide for protection against extreme weather events).

Spatial planning should be based on the designation of areas suitable for aquaculture through a process involving coordination among different relevant authorities at different levels. This process should start with the mapping of existing and potential aquaculture areas in a way that is consistent with existing environmental planning

[16] For further details on EU freshwater aquaculture, see study from EUMOFA (https://www.eumofa.eu/documents/20178/442176/Freshwater+aquaculture+in+the+EU.pdf), and country profiles (https://www.eumofa.eu/documents/20178/442176/Country+profiles.pdf).

[17] Directive 2014/89/EU establishing a framework for maritime spatial planning.

[18] For the purposes of these guidelines, 'offshore aquaculture' is aquaculture 'located > 2 km or out of sight from the coast, in water depths > 50 m, with wave heights of 5 m or more, ocean swells, variable winds and strong ocean currents, in locations that are exposed (open sea, e.g. ≥ 180o open) and where there is a requirement for remote operations, automated feeding, and where remote monitoring of operating systems may be required (definition in the context of the 2010 FAO workshop 'Expanding mariculture further offshore, Technical, spatial and governance challenges').

[19] For molluscs, the availability of good-quality water is essential, as water can accumulate harmful substances that can compromise the molluscs' viability and sanitary quality. EU legislation is in place to guarantee good water quality for bivalve molluscs.

(including River Basin Management Plans). Such mapping should include a process to identify the potential to restore abandoned aquaculture facilities or convert existing industrial facilities to aquaculture. It should also seek to promote synergies between different activities and multiple uses of space, such as encouraging aquaculture development in combination with the development of offshore wind power.

The designation of areas suitable for aquaculture should be based on clear and transparent criteria and tools to identify new areas. Those tools include: (i) evaluating impacts on the ecosystem through a strategic impact assessment; (ii) setting water-quality requirements (in particular for farming of molluscs); (iii) evaluating potential synergies and conflicts with other activities; (iv) determining the area's 'carrying capacity'[20]; and (v) defining the necessary distance of aquaculture sites from pollution sources. The designation should be accompanied by setting up an appropriate mechanism to: (i) monitor and collect data on the environmental impacts of aquaculture activities; and (ii) monitor water quality (notably for areas used to farm molluscs).

2.1.2. Regulatory and administrative framework

The complexity of national licensing systems and the lack of predictability of the timeline and outcome of licensing procedures are still flagged by the EU aquaculture sector as important barriers to growth. Licensing procedures can be particularly burdensome for SMEs. Challenges lie in both the sector's complex regulatory framework and the need to involve multiple authorities in the licensing process. Furthermore, concerns about the impact of aquaculture activities on the environment or on other economic activities often lead to appeal procedures, which further delay the process for obtaining or renewing a licence.

The most important elements for addressing these issues while ensuring due consideration of environmental aspects in licensing procedures are the following:

- Streamlining – and harmonising where possible – legislation and administrative guidance on aquaculture. Ideally, this streamlining should be carried out by adopting a single piece of national legislation gathering all relevant aspects. This legislation should set clear procedures and timeframes for dealing with applications for new licences or licence renewals.

- Setting up, whenever possible, a single national aquaculture entity gathering all the different relevant authorities with responsibilities for aquaculture. This entity would seek to facilitate and coordinate the work of those authorities on the planning, licensing and monitoring of aquaculture activities. This entity should involve relevant stakeholders to discuss and integrate their views in a timely manner. In cases where responsibility for aquaculture is also held at sub-national level, a national structure gathering regional/local authorities and entities is to be encouraged.

[20] The carrying capacity in aquaculture is defined as the maximum biomass of a farmed species that can be supported without exceeding the maximum acceptable impacts to the farmed stock and its environment.

- Setting up a 'one-stop-shop' system for aquaculture licences, which facilitates both transparency on the licensing process and interaction between the applicant and the decision-making authorities.

- Designating areas suitable for aquaculture according to the principles mentioned in Section 2.1.1 above.

- Providing for longer-term licensing, with regular monitoring and sanctions for non-compliance (which could include licence revocation). Licensing terms should include an obligation to monitor and report data, notably those data required under the relevant national and EU legislation.

Progress by EU Member States in addressing these aspects would also respond to the concerns of EU aquaculture producers on a lack of a level playing field for aquaculture activities in the EU due to differences between EU Member States in terms of burden for obtaining licenses for new farms.

2.1.3. Animal health and public health

Despite EU legislation on aquatic health[21] and EU-funded research in this area, infectious diseases remain a very significant constraint on aquaculture productivity[22]. These diseases also pose a problem for animal welfare. The challenges that still need to be addressed in this area are:

- the lack of good husbandry practices and technologies tailored to each aquaculture species;

- the need to better prevent disease and parasite infestation and thereby reduce the need for veterinary medicines;

- the need to reduce the use of pharmaceuticals, including antimicrobials and anti-parasitic substances, which may damage the environment or contribute to antimicrobial resistance;

- research gaps (including on the fish microbiome, the potential impact of climate change on fish health, and the impact of stress on the fish immune system);

- the low availability of specific veterinary medicines (including vaccines) for use in aquatic animals[23];

- the lack of codes of good practice for the early detection, prevention and control of aquatic diseases not listed in relevant EU legislation;

[21] Applicable animal-health legislation includes: Regulation (EU) 2016/429 on transmissible animal diseases ("Animal Health Law"), applicable from 21 April 2021; and the current legal framework for veterinary medicinal products and medicated feed (Directive 2001/82/EC, Regulation (EC) No 726/2004 and Directive 90/167/EEC), which will be replaced by Regulation (EU) 2019/6 on veterinary medicinal products and Regulation (EU) 2019/4 on medicated feed that will apply from 28 January 2022.

[22] This is particularly the case for mollusc farming. In recent years, a growing number of mortality cases associated with pathogenic organisms have been observed, seriously affecting the sustainability of mollusc farms. Mollusc farming is also challenged by harmful algae blooms, marine pollution, and the impact of climate change.

[23] The new Regulation (EU) 2019/6 on veterinary medicinal products will help to increase the availability of veterinary medicines for aquaculture and provide incentives to stimulate innovation.

- the need for more consistent and thorough investigation of aquatic diseases in certain EU Member States and within certain sectors; and
- the management in mollusc farming of noroviruses, which can represent not only a threat to public health, but also put at risk the economic viability of mollusc farms[24].

2.1.4. Climate-change adaptation and mitigation

The aquaculture sector will need to adapt to the many disruptive impacts of climate change and improve its resilience. The EU's Climate Adaptation Strategy and national strategies/plans provide a framework for policy makers to ensure they implement comprehensive and efficient climate-change adaptation measures[25]. Dedicated sectoral adaptation strategies should address the aquaculture sector specifically[26]. At the same time, any potential negative contribution made by aquaculture to climate change needs to be minimised. Energy consumption and carbon emissions from production, transport and processing must be reduced as much as possible.

But aquaculture also has great potential to mitigate climate change. When subject to an appropriate framework, certain types of aquaculture, such as the cultivation of seaweed and molluscs, can provide climate-mitigation services (such as carbon sequestration[27]) or climate-adaptation services (such as nature-based coastal protection). Other types of aquaculture, when managed appropriately, can help preserve ecosystems such as ponds or wetlands. These ecosystems provide protection against climate-change impacts such as sea-level rise and floods. This type of aquaculture should be promoted.

2.1.5. Producer and market organisations

The situation faced by the aquaculture sector due to the outbreak of COVID-19 has demonstrated the value of producer organisations (POs) for collective action, in particular for small-scale producers. POs provide more bargaining power when dealing with processors and retailers. They also make it possible to share resources and benefit from joint services (e.g. advice, promotion campaigns) that would otherwise be too costly for individual producers. In addition, POs facilitate collective management and/or self-regulatory initiatives between producers. And while POs can help producers to organise, inter-branch organisations allow better integration of actors across the value chain. They also facilitate self-regulatory initiatives between producers, processors and

[24] New knowledge and innovative techniques are needed to help tackle diseases affecting bivalve molluscs such as norovirus.

[25] A new EU Climate Adaptation Strategy was adopted on 24.02.2021.

[26] EU-funded projects have strengthened the knowledge base for the design of impactful climate-adaptation measures in different policy sectors, including aquaculture. Many of the findings of these projects and other useful information are available to the public on the web platform Climate-ADAPT. Climate-ADAPT is a 'one-stop shop' for climate adaptation established jointly by the Commission and the European Environment Agency (EEA). Information for the marine and fisheries sector is available at https://climate-adapt.eea.europa.eu/eu-adaptation-policy/sector-policies/marine-and-fisheries.

[27] The Farm to Fork Strategy refers to the new EU carbon-farming initiative under the Climate Pact, as well as the regulatory framework for certifying carbon removals to be developed by the Commission. Aquaculture offering carbon-capture services should be taken into consideration in this context to provide the necessary incentives to develop this type of aquaculture. Promoting aquaculture with climate-mitigation services could also be considered in the context of the nationally determined contributions (NDCs) under the Paris Agreement on climate change.

retailers. Inter-branch organisations also help to implement and control labelling requirements.

Despite the support available to recognised POs and inter-branch organisations through the European Maritime and Fisheries Fund (EMFF) (notably the support given to their production and marketing plans[28]), only a limited number of POs have been set up[29]. The creation of POs would be particularly helpful in increasing the bargaining power in the food-supply chain of aquaculture producers of molluscs and freshwater species. These producers typically tend to be smaller companies which sell their product whole and do not benefit from vertical integration with processors and retailers.

Aquaculture producers have raised concerns about the difficulty, particularly for small-scale producers, of setting up a PO and having it recognised under Regulation (EU) No 1379/2013 on the common organisation of the markets in fisheries and aquaculture products (CMO Regulation). This difficulty is mostly due to the financial means required and administrative hurdles. To facilitate the recognition of POs and other professional organisations, and to extend their rules to non-members, the Commission has prepared a non-binding guidance document[30]. The Commission also continuously supports the sector through methodological support and participation and exchanges in technical meetings.

2.1.6. Control

Another important aspect in ensuring the sustainability and profitability of EU aquaculture is the adequate control by each Member State of aquaculture products across the supply chain (from their catch/harvest to the retail sale, including transport) in accordance with the EU Fisheries Control Regulation[31]. Traceability obligations allow knowing the origin of aquaculture products and combatting fraud. The Commission proposal for a new Fisheries Control Regulation[32] extends the traceability obligations to all aquaculture products, including processed products and products imported from non-EU countries. Traceability is therefore also a valuable tool to ensure a level playing field on the EU market.

2.1.7. Diversification and adding value

The EU aquaculture sector still has great scope for further diversification, not only in the farming of promising new species (notably diversification into non-fed and low-trophic species with a lower environmental footprint) but also in production methods (e.g. polyculture in pond aquaculture, integrated multi-trophic aquaculture). It is also important to work more on processing and packaging aquaculture products into new value-added products (e.g. fillets and ready-to-use products) which are attractive to

[28] Support for PO production and marketing plans is mandatory under the EMFF. Production and marketing plans will continue to be eligible for support under the new EMFAF but on a voluntary basis.
[29] There are currently 32 aquaculture POs recognised and no transnational organisation. See https://ec.europa.eu/fisheries/sites/fisheries/files/list-of-recognised-producer-organisations-and-associations-of-producer-organisations.pdf. There are other ways for producers to organise which are not recognised under the CMO Regulation (e.g. association of producers around a quality label).
[30] See https://ec.europa.eu/fisheries/sites/fisheries/files/docs/body/guidance-document-on-implementation-of-professional-organisations_en.pdf.
[31] See Council Regulation (EC) No 1224/2009.
[32] COM/2018/368 final.

younger consumers. This is particularly important for more traditional forms of shellfish and freshwater aquaculture. Another important tool for promoting the value of EU aquaculture products is the use of quality schemes and labels (subject to appropriate control to safeguard their credibility), including geographical indications[33]. Promoting EU sustainable aquaculture as an example of local production linked to short food circuits also plays an important role in diversifying and adding value to EU aquaculture production.

Geographical diversification should also be promoted. Member States where aquaculture remains a marginal sector should explore and further develop the potential that aquaculture provides in terms of sustainable supply of food and feed and the creation of alternative sustainable businesses and jobs, especially in remote areas where job options are limited.

2.2. Participating in the green transition

The EU aquaculture sector, like other sectors of the EU economy, has to participate in the green transition set by the European Green Deal. This sector has a particular role to play in contributing to the transition to sustainable food systems, but also to the development of the bioeconomy and the circular economy (through the use of renewable aquatic resources), and to reversing biodiversity loss, amongst others by reducing pollution. Furthermore, moving further towards the 'competitive sustainability'(as expressed in the Farm to fork Strategy), i.e. making of sustainability the EU's trademark, offers the sector a significant economic opportunity, notably considering the increasing attention paid by the public to the environmental footprint of products in the market and to animal welfare.

2.2.1. Environmental performance

Aquaculture requires good environmental conditions, such as good water quality. Therefore, the fight against water pollution by EU Member States, in line with the zero pollution ambition defined in the European Green Deal, is of particular importance to aquaculture[34]. When properly managed, aquaculture can also be a method of protein production with a lower carbon and environmental footprint than other types of farming. Furthermore, certain forms of aquaculture (e.g. mollusc farming, aquaculture in ponds and wetlands, and the farming of algae and other invertebrates), when appropriately managed, can offer many ecosystem services. These services include the absorption of excess nutrients and organic matter from the environment or the conservation and restoration of ecosystems and biodiversity.

EU environmental legislation and implementing national legislation have set the regulatory framework for EU aquaculture. This framework ensures the mitigation of the impact that aquaculture activities may have on the environment (be it in terms of carbon footprint, effluents, waste or other impacts on marine and freshwater ecosystems), and

[33] See Regulation (EU) No 1151/2012 on quality schemes for agricultural products and foodstuffs. The Farm to Fork Strategy states that the Commission 'will strengthen the legislative framework on geographical indications (GIs) and, where appropriate, include specific sustainability criteria'.
[34] The upcoming Zero Pollution Action Plan will reinforce action against water pollution.

that aquaculture activities do not significantly harm ecosystems or biodiversity[35]. Commission guidance documents[36] and case-law by the European Court of Justice[37] clarify the application of this legislation to the aquaculture sector. However, the requirements under EU legislation are not always clear to all actors[38]. And interpretation by EU Member States of EU legislation does not seem to be uniform, undermining the level playing field for aquaculture producers in the EU. Furthermore, the implementation of relevant EU legislation is often shared among different administrative entities or governance levels, which may not always ensure sufficient cooperation or have the necessary level of expertise on the sector. Further efforts are therefore necessary to ensure a more uniform and coherent implementation of the environmental regulatory framework.

In particular, the complexity of EU legislation in place to guarantee good water quality for bivalve molluscs creates confusion. This legislation would benefit from clarifications and better linkages with other relevant pieces of EU legislation. Greater clarity is especially needed on differences in requirements (in terms of classification of harvesting areas, sanitary surveys, registers of protected areas, etc.)[39].

The environmental performance of the EU aquaculture sector can be further improved. This can be achieved by: (i) ensuring that environmental legislation is applied and its objectives are met; (ii) further mitigating the impact of aquaculture; and (iii) promoting aquaculture with lower environmental impact and aquaculture that provides ecosystem services. The following issues should be addressed to achieve this.

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[35] In particular, the following legislation applies to aquaculture, among other activities: the Water Framework Directive (Directive 2000/60/EC); the Marine Strategy Framework Directive (Directive 2008/56/EC); the Decision on Good Environmental Status (Decision 2017/848/EC); the River Basin Management Plans; the Birds and Habitats Directives (Directive 2009/147/EC and Directive 92/43/EEC); the Industrial Emissions Directive (Directive 2010/75/EU); the Regulation concerning the use of alien and locally absent species in aquaculture (Regulation (EC) No 708/2007) and the Regulation on invasive species (Regulation (EU) 1143/2014); the Environmental Assessment Directive (Directive 2011/92/EU); and the Strategic Impact Assessment Directive (Directive 2001/42/EC). Furthermore, specific legislation for organic production promotes, through certification and labelling, aquaculture that complies with stricter production requirements on environmental impact and animal welfare, as well as limited and regulated use of external inputs.

[36] See the Commission staff working document on the application of the Water Framework Directive and the Marine Strategy Framework Directive to aquaculture (https://ec.europa.eu/fisheries/sites/fisheries/files/docs/body/swd-2016-178_en.pdf) and the guidance on aquaculture and Natura 2000 (https://ec.europa.eu/environment/nature/natura2000/management/docs/Aqua-N2000%20guide.pdf).

[37] For example, the ECJ ruling in the Weser Case (Case C-461/13 Bund v Germany [2015] ECR I-433) on the interpretation of the Water Framework Directive.

[38] According to the interim evaluation of the Open Method of Coordination, Commission guidance on the application of EU legislation to the aquaculture sector is not sufficiently known by all relevant actors. Freshwater aquaculture producers, in particular, argue that it is not always well understood how to implement production requirements in Natura 2000 sites, and consider a challenge to apply the requirements of the Water Framework Directive.

[39] The applicable legislation is Regulation (EU) 2017/625 on Official Controls and the Water Framework Directive. The Official Controls Regulation requires Member States' competent authorities to undertake an extensive programme of official control monitoring of live bivalve molluscs from their harvesting waters. The results of this programme are used to determine whether an area should be open or closed for harvesting depending on the levels of microbiological and chemical contaminants, including marine biotoxins. On the other hand, the Water Framework Directive requires Member States' competent authorities to ensure the special protection of waters for mollusc production. EU mollusc farmers have complained that Member States are not implementing the Water Framework Directive correctly with respect to mollusc farming.

- Using life-cycle approaches in the assessment of the environmental impact of the EU aquaculture sector;

- Ensuring sustainable feed systems. This means using feed ingredients that are sourced in the way that is most respectful of ecosystems and biodiversity and which, at the same time, are appropriate for ensuring the health and welfare of the animals. It also means limiting feed producers' reliance on fish meal and fish oil taken from wild stocks (e.g. using alternative protein ingredients such as algae or insects or the waste from other industries). This also covers the use of feed supplements and efficient feed-management systems.

- Developing solutions to reduce the use of veterinary products and other substances (e.g. anti-fouling agents), through, for example, appropriate husbandry practices).

- Where it is necessary to use veterinary products and other substances, promoting the use of those with a small environmental footprint.

- Ensuring environmental monitoring of aquaculture sites, including water quality, discharges and emissions (of organic matter, nutrients, plastics, veterinary medicines, other pollutants, or any form of waste and litter).

- Setting up management practices including a risk strategy for mitigating impacts (including those related to any discharges and emissions), the management of predators, and the prevention of escapees, in particular with regard to their potential adverse impact on local species and biodiversity, including their potential for becoming invasive.

- Limiting the contribution of aquaculture activities to marine litter.

- Promoting the use of renewable energy sources and greater energy efficiency.

- Implementing waste management systems that minimize the environmental footprint of aquaculture activities.

- Applying a circular-economy approach, including the use of waste.

- Promoting the development of organic aquaculture[40] and other aquaculture systems with lower environmental impact, such as: energy-efficient recirculating aquaculture systems[41], integrated multi-trophic aquaculture systems (IMTA), as

[40] Cf. footnote 2. The Commission adopted on 25.03.2021 a new Action Plan for the development of organic production, which also provides for measures to promote EU organic aquaculture(COM(2021) 141 final).

[41] Recirculating aquaculture systems (RAS) are production systems which offer: a fully controlled environment for fish, low water use, full disease control, efficient land use, optimal feeding strategies, and proximity to markets. Despite the important potential of RAS, this technology seems so far profitable only for 'niche markets' for high-value products (e.g. salmon, kingfish, and eel). RAS still face many challenges: the need for a big investment, the use of a lot of technology, the need for technically skilled staff, high energy use, or problems with the taste of the product. However, technological developments

well as the diversification to lower-trophic species (molluscs[42] and other invertebrates and algae and herbivore fish).

- Promoting and providing value to forms of aquaculture that offer ecosystem services, including in ponds, wetlands and brackish waters[43].

- Supporting both maintenance and improvement of aquatic genetic resources and the use of selective breeding for aquaculture stocks[44].

2.2.2. Animal welfare

More attention should be paid to the welfare of fish, and not only because of the increasing public interest in – and demand for – high-welfare fish products. Keeping fish under good welfare conditions also has economic benefits for the industry, through reduced costs and better-quality products. EU legislation on animal welfare[45] includes general requirements on the keeping, transport and slaughter of farmed fish. And the EU Regulation on Organic Production[46] sets out more specific requirements, such as maximum stocking-density levels, restrictions on the use of artificial light and oxygen, etc. Further action to improve fish welfare is necessary, focusing on:

- developing good practices on fish welfare during farming, transport and killing;

- setting common, validated, species-specific, and auditable fish-welfare indicators throughout the production chain (including in transport and slaughtering);

- further research and innovation, in particular on species-specific welfare parameters, including nutritional needs in different rearing systems; and

- providing knowledge and skills on fish welfare to aquaculture producers and other operators that handle live farmed fish.

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could soon address current challenges. See report from EUMOFA on 'Recirculating Aquaculture Systems' on https://www.eumofa.eu/documents/20178/84590/RAS+in+the+EU.pdf.

[42] Molluscs are filter feeders and do not need to be fed. They offer many other benefits to the environment, such as improving water quality and clarity by removing particulates, excess nutrients, organic material, viruses, and bacteria from the water column. Mollusc beds provide critical ecosystem functions by creating structure and habitats for other species such as crabs, worms, and juvenile fish, that provide a food source for fish and other marine species. Molluscs also remove nitrogen from the environment that is removed when the animals are harvested. The Interreg-financed Baltic Blue Growth Initiative demonstrated the nitrogen-removal ability of mussel line culture. See https://www.interreg-baltic.eu/news-detail/news/new-blue-growth-initiatives-for-the-baltic-sae-region.html.

[43] Ponds and wetlands play an important role in water retention and biodiversity conservation.

[44] Selective breeding is based on the use of natural (genetic) variation in desired traits through targeted selection of populations, strains, families or individuals.

[45] See Council Directive 98/58/EC concerning the protection of animals kept for farming purposes, and Council Regulation (EC) No 1099/2009 on the protection of animals at the time of killing. The Farm to Fork Strategy envisages the evaluation and revision of existing animal-welfare legislation in 2023, including on animal transport and slaughter of animals.

[46] Commission Regulation (EC) No 889/2008, laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control. A new Regulation (EU) 2018/848 on organic production and labelling of organic products has been adopted and will be applicable as from 1 January 2022

2.3. Ensuring social acceptance and information to the consumer

The growth of EU aquaculture and its competitiveness rely largely on social acceptance and the recognition of the benefits and value of aquaculture activities and EU aquaculture products. There are three factors that are particularly important for achieving this acceptance: communication on EU aquaculture, integration of EU aquaculture in local communities, and data collection and monitoring.

2.3.1. Communicating on EU aquaculture

It is critically important to ensure more accurate information and transparency about how aquaculture activities are carried out. A negative perception by local stakeholders of aquaculture activities, notably their impact on the environment and other economic activities, is often an obstacle to the establishment of new aquaculture facilities. On the other hand, the benefits of aquaculture (such as providing jobs in remote areas, as a low-carbon source of food, or offering ecosystem services) are largely unknown to the public.

Information is also essential to meet the increasing consumer demand for sustainable products[47]. Making consumers more aware of the efforts made by EU producers is important to allow EU production to reap the benefits of high sustainability and quality standards. This will help to make EU aquaculture products more competitive and also ensure a level playing field with other aquaculture products that may not offer equivalent sustainability and quality. Finally, communication will be necessary to realise the potential of a more diversified aquaculture to meet the challenges identified in the European Green Deal. These challenges include increasing the knowledge and consumption of– aquaculture products with a lower environmental footprint, in particular under-exploited low-trophic species such as algae, shellfish and other invertebrates, and herbivorous fish.

Improving the information available to consumers and the public on EU aquaculture production requires a mix of different tools, notably:

- labelling[48] and marketing standards[49] (the Commission is working to review the current marketing standards for fisheries and assessing the possibility to define standards for the aquaculture products);

[47] This demand is currently being largely met either through organic production or through a few (often costly) private standards and certification systems. However, according to the EUMOFA report on EU organic aquaculture, it is still necessary to provide more information on the sustainability of organic aquaculture in the EU (see https://www.eumofa.eu/documents/20178/84590/Study+report_organic+aquaculture.pdf).

[48] The CMO Regulation sets certain mandatory requirements on information to the consumer. However, this Regulation does not require the production method of aquaculture products to be specified on the final product. It only sets an obligation to indicate that the product is 'farmed'. Only organic aquaculture products have associated specific production methods. Furthermore, the CMO Regulation does not require information to be provided on the origin of processed aquaculture products.

[49] The CMO Regulation established common marketing standards that fishery products must comply with to enter the EU market for human consumption. However, the current standards do not cover aquaculture products. The Farm to Fork Strategy envisages the review of marketing standards, including for fisheries and aquaculture products.

- information campaigns about the EU aquaculture sector and production that involve retailers;

- clarifying the scientific basis of the debate on the impacts of aquaculture activities in the EU;

- further opening the sector to the public (opening of farms to visitors including schools and other education providers, providing more information on farming conditions);

- ensuring close and early engagement of authorities and industry with stakeholders' groups, including NGOs;

- promoting the use of branding and quality labels (subject to appropriate control to safeguard their credibility), including geographical indications, covering also sustainability aspects; and

- promoting the value of EU aquaculture as 'local and fresh' with short food circuits.

2.3.2. Integration in local communities

Just like any other activity, the expansion of aquaculture also requires social acceptance (so called "social license to operate"). As mentioned above, the perception of aquaculture activities remains negative among certain stakeholders. This is mainly due to concerns about aquaculture's impact on the environment or about how it conflicts with other economic activities such as fisheries or tourism. It is important to address these concerns by: (i) ensuring transparency and the early involvement of local stakeholders in the planning of an aquaculture activity; and (ii) seeking synergies with existing activities (e.g. fisheries, tourism, the processing industry) and protected areas. In addition, there is great potential in creating local value chains and short supply circuits, which should contribute to environmentally, economically and socially sustainable food production. The experience gathered from the work of fisheries local-action groups (FLAGs)[50], as well as projects funded under the EMFF in some Member States, show some good practices in this area.

2.3.3. Data and monitoring

Collecting accurate data is necessary to ensure the appropriate planning of aquaculture activities. Accurate data are also necessary to assess and monitor the social, economic and environmental performance of the EU's aquaculture sector. Transparency and data reporting is also important for maintaining the trust of the consumer and other stakeholders in the sector. There are many reporting obligations on the sector under different pieces of EU and national legislation. However, the data collected are mostly

[50] FARNET (Fisheries Areas Network) already developed a guide on integrating aquaculture within local communities (https://webgate.ec.europa.eu/fpfis/cms/farnet2/library/guide/integrating-aquaculture-within-local-communities_it), as well as a guide on the circular economy in fisheries and aquaculture areas (https://webgate.ec.europa.eu/fpfis/cms/farnet2/library/farnet-guide-17-circular-economy-fisheries-and-aquaculture-areas_en).

socioeconomic data on marine aquaculture or animal health, and limited data are reported on environmental indicators specific to aquaculture[51]. Therefore, it will be necessary to coordinate better reporting obligations and to streamline reporting procedures between different services. It will also be necessary to provide more structured guidance to EU Member States on how to obtain and report data. Data reporting should also apply to environmental indicators and cover aquaculture production beyond marine aquaculture[52].

2.4. Increasing knowledge and innovation

Knowledge and innovation (including the use of digital technology) are key to achieve the other objectives set for the EU aquaculture sector in this Communication. They are especially important for building the resilience and competitiveness of aquaculture and ensuring its green transition.

Horizon Europe, the forthcoming EU framework programme for research and innovation, offers an important opportunity to make a step forward in this area. Research and innovation on sustainable aquaculture is an important priority under Horizon Europe. Decisive action for aquaculture is required to ensure that research and innovation: (i) responds faster to the current and future challenges and opportunities of the sector; (ii) avoids duplication of efforts; and (iii) creates synergies. In particular, further efforts are needed in the following areas.

- Creating a framework for cooperation that brings together public authorities, industry, researchers, and educators, both at national and regional/local levels. This framework should include the development of innovation clusters for sustainable aquaculture[53].

- Fostering the development and matching of research and innovation strengths across Member States and regions. This should include smart-specialisation strategies aimed at building full value chains across the EU.

- Fostering effective dissemination of research and innovation results to industry end-users and the general public, as well as their exploitation, including by means of the close monitoring of the establishment and implementation of solid dissemination and exploitation plans of EU funded projects.

- Promoting complementarity and synergies between research projects.

[51] EU environmental legislation requires information about the status of aquatic ecosystems and about water quality, but it does not contain reporting obligations specific to aquaculture activities.
[52] Under the Commission proposal for the new EU Multiannual Programme for data collection under the Data Collection Framework (to be applied from 2022) Member States will collect socioeconomic data on freshwater when national freshwater aquaculture production is above certain thresholds (1% EU production, 10% national production).
[53] Clusters group innovative actors such as universities together with SMEs. This promotes the creation of more jobs and can help in the registration of more international trademarks and patents.

- Facilitating access to EU funds for research and innovation in the aquaculture sector, by providing a clear overview of the available EU funding.

Bringing innovation to the aquaculture sector requires promoting investment in innovative solutions. Investors often enter unfamiliar territory when investing in innovation. The EU's BlueInvest initiative (which also promotes innovation in aquaculture) will continue to bring together investors and entrepreneurs. A financial instrument will be set up with EMFAF and InvestEU contributions and will also be available to support investment in sustainable aquaculture activities and technologies. EU Member States can also use funds under the future EMFAF to support investments in innovative solutions by the EU aquaculture sector.

An innovative aquaculture sector also demands the development of appropriate skills. This can be achieved through the promotion of specialised curricula and knowledge on aquaculture (e.g. specialised veterinary studies for fish and training on fish health for aquaculture operators), as well as life-long training for farmers on innovative approaches for the aquaculture sector.

3. CONCLUSION

Sustainable aquaculture in the EU can play an important role in delivering public goods. These public goods include: (i) nutritious and healthy food with a limited environmental footprint; (ii) economic development and job opportunities for coastal and rural communities; (iii) reducing pollution; (iv) preserving ecosystems and biodiversity; and (v) contributing to the fight against climate change. This Communication sets the path for EU aquaculture to become a reference as a sector that is resilient, competitive and a global standard in sustainability and quality. To achieve this objective, it is necessary to have the support of all relevant actors (including EU Member States, the EU aquaculture industry, and other stakeholders such as NGOs) in implementing these guidelines and the actions recommended in the annex to this Communication. The Commission invites EU Member States to ensure the appropriate means to implement these guidelines and actions.

To implement the guidelines it is also necessary to support the sustainable transition of the aquaculture sector by ensuring effective and efficient use of public funding and attracting private investment. The annex to this Communication provides recommendations for actions to achieve this. In particular, the Commission invites EU Member States to take into consideration the priorities set out in these guidelines for allocating support to the sector under EU and national funds.

To support the implementation of these guidelines by all stakeholders, the Commission will set up an EU Aquaculture Assistance Mechanism. This mechanism should serve as a tool to help the Commission, EU Member States, the industry, and other stakeholders to develop further guidance and consolidate best practices on the areas covered in this Communication. The assistance mechanism will also help implement that guidance and best practices. This mechanism should include an online platform with an accessible knowledge base for all stakeholders (for example, a guide on EU funding and a database of EU-funded projects in the sector).

The Commission invites EU Member States to actively promote the objectives and principles stated in this Communication, notably the need for aquaculture to develop in a sustainable manner that is respectful of the environment, in the context of: (i) the sea basin strategies; (ii) bilateral agreements; and (iii) participation in international fora (e.g. the FAO).

The Commission will undertake, not later than four years after the publication of this Communication, an assessment of: (i) the progress made in developing the recommended actions in the annex; and (ii) the efficiency of these actions in helping achieve the objectives laid down in these new strategic guidelines, with the possibility of adapting actions accordingly. By 2029, an evaluation of the new Strategic Guidelines will be carried out, which will assess their efficiency, effectiveness, coherence, relevance and EU added value, to provide the evidence base and support the decision on the next steps after 2030.