FEDERATION OF EUROPEAN AQUACULTURE PRODUCERS

Technical Screening Criteria for sustainable finfish aquaculture: input to the EU marketing standards, towards a sustainable food system and the EU taxonomy

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Authors:
Lisbeth Jess Plesner, Dansk Akvakultur, Denmark, Richard Beckett, Salmon Scotland, Scotland, Michiel Fransen, ASC, The Netherland, Tor Eirik Homme, Grieg Seafood ASA, Norge, Catarina Martins, Mowi, Norge, Lorenzo Maynard, Caviar Pirinea, Spain, Spain Szilvia Mihalffy, FEAP, Hungary, Ivana Šimunović, Cromaris d.d., Croatia, and Henrik Stenwig, Sjomat, Norge

Table of Contents

Avenue des Arts 56, 1000 Brussels (Belgium) | Tel. : +32 4 3382995 | secretariat@feap.info

Executive Summary

The transition to a more resource-efficient and circular economy while maintaining profitable business and societal value is critical to a sustainable food system. Although the availability of food is not a current major concern in Europe, ensuring a sustainable, safe, affordable, and nutritious supply of food is a challenge for any society. According to the From Farm to Fork strategy, we need to redesign our food systems which today account for nearly one-third of global GHG-emissions. Seafood is clearly recognised as having a lower environmental and climate impact as compared to alternative terrestrial proteins, and a dietary shift towards increased aquatic food consumption is recognised as part of the solution to climate change. Finfish aquaculture can contribute to this transition of the food system by producing safe, nutritious, environmentally friendly and climate efficient food.

Clear guidance about how the finfish aquaculture sector can contribute substantially to the environmental and social objectives, and Technical Screening Criteria to secure that the activity does not cause any significant harm is important. The Federation of European Aquaculture Producers (FEAP) and the Aquaculture Stewardship Council (ASC) have worked together to develop a simplified set (robust baseline) of environmental and social sustainability standards. The aim is to improve the reception of the aquaculture sector in Europe, ensure it is better recognised at a political level and encourage investment.

16 Technical Screening Criteria and 35 indicators are developed for marine and freshwater finfish aquaculture. These Technical Screening Criteria should secure no significant harm regarding environmental and social objectives. Further it has been identified that finfish aquaculture can make a substantial contribution to climate change mitigation and adaptation, to the circular economy, to the protection and restoration of biodiversity and ecosystems and to social objectives. Based on that, sustainable farmed finfish aquaculture should play a significant role in the transition towards a sustainable food system in the EU.

Authors:
This report is a collaboration between Federation of European Aquaculture Producers (FEAP) and Aquaculture Stewardship Council (ASC) lead by Lisbeth Jess Plesner. The following have contributed to this work:

Lisbeth Jess Plesner, Dansk Akvakultur, Denmark
Richard Beckett, Salmon Scotland, Scotland
Michiel Fransen, ASC, The Netherland
Tor Eirik Homme, Grieg Seafood ASA, Norge
Catarina Martins, Mowi, Norge.
Lorenzo Maynard, Caviar Pirinea, Spain
Spain Szilvia Mihalffy, FEAP, Hungary
Ivana Šimunović, Cromaris d.d., Croatia
Henrik Stenwig, Sjomat, Norge

1. Introduction

European food aspires to be recognised as safe, nutritious, and sustainable. Although the transition to more sustainable food systems has started, feeding a fast-growing world population remains a challenge with current production patterns and systems. There is a clear need to increase the availability and consumption of food that has a significant positive impact both on people's health and our planet.

According to the From Farm to Fork strategy[1], we need to redesign our food systems which today account for nearly one-third of global GHG emissions. The Farm to Fork Strategy aims to accelerate the transition to a sustainable food system, a transition which will not happen without a shift in people's diets.

The transition to a more resource-efficient and circular economy while maintaining profitable businesses is crucial to ensuring the long-term competitiveness of the EU economy. Although the availability of food is not a major concern in Europe, ensuring a sustainable, safe, affordable, and nutritious supply of food is a challenge. Advice on how to deliver an inclusive, fair, and timely transition towards a sustainable food system in Europe, delivering health, environmental and socioeconomic benefits was published in March 2020[2].

In this work, Technical Screening Criteria are developed for sustainable finfish aquaculture, as input to the marketing standards under the common market organisation, the EU Taxonomy, and the EU Sustainable Food System.

Finfish aquaculture - transition to a sustainable food system

According to the Farm to Fork Strategy farmed fish and seafood production have a lower carbon footprint than terrestrial animal production. This is also substantiated by solid science (BFA, 2021; Ocean Panel, 2021).

Seafood or 'Blue Foods' are clearly recognised by scientists as having a lower environmental impact as compared to alternative animal proteins (particularly with respect to climate impact, nutrient efficiency, freshwater and land use). In fact, dietary shifts towards increased seafood consumption are recognised as part of the solution to climate change (Ocean Panel, 2021).

Over recent years, a significant number of scientific reviews have highlighted the role of Aquatic or Blue Foods, including food coming from aquaculture, as part of the solution to both climate change and food security (Costello et al., 2019). The production of food from the ocean, through aquaculture, is clearly recognised as a 'triple win' benefiting:

- People: Blue Foods have a unique combination of important nutrients namely protein, omega-3 fatty acids and micronutrients (Golden et al., 2021; Stuchtey et al. 2020);
- Planet: Blue Foods production generally has a lower carbon footprint when compared to terrestrial animal proteins such as chicken, pork or beef (Gephart et al., 2021). This is also recognised by the technical working group of the *Platform on Sustainable Finance* (Part B, 2022);
- Investment: local/global economies; investing in aquaculture can yield a benefit:cost ratio of 10:1 in the next 30 years (Stuchtey et al., 2020).

[1] https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy_en
[2] Towards a Sustainable Food System, Group of Chief Scientific Advisers, Marts 2020

Finfish aquaculture, because of its lower carbon footprint than other animal protein production (Clune et all., 2017; Gephart et al., 2021), can contribute significantly to drive dietary shifts to more climate-friendly food. This can contribute significantly to reduce the emissions gap needed to respect the Paris agreement (Costello et al., 2020). Sustainable aquaculture should therefore be considered as a sector with a significant positive impact on climate change.

This is also highlighted in the report from the technical working group of the *Platform on sustainable finance*[3] (p. 198 and p. 203); In this report it also appears that farmed fish has a lower land use (3,7 m^2 per 100 g protein) than other protein such as beef (163.6 m^2 per 100 g protein), pig meat (10.7 m^2 per 100 g protein) and poultry meat (7.1 m^2 per 100 g protein) eggs (5,7 m^2 per 100 g protein), cheese (39,8 m^2 per 100 g protein) and as well as grains (4,6 m^2 per 100 g protein) according to Our world in data[4].

Science has shown that fisheries, aquaculture, and dietary shifts have a significant role to play in reducing planetary GHG emissions (Stuchtey et al., 2020). This recognition is a result of seafood, including farmed fish, having a lower carbon footprint as compared to alternative land animal proteins such as pork, beef, and chicken.

Therefore, it is important that the EU aquaculture sector continues to grow to make climate-smart food more available and support a dietary shift which can contribute to achieving the Paris agreement[5].

Finfish aquaculture has a substantial contribution to climate change mitigation as this can be documented by the following:

- have a climate accounting aligned with the GHG protocol or the PEF (Product Environment Footprint)[6],
- have targets on reducing GHG emission,
- have a roadmap developed to further promote reduction in GHG emissions.

2. Aquaculture

The Technical Screening Criteria cover farming of all EU finfish aquaculture on land, in lakes and in the sea. In accordance with the statistical classification of economic activities established by Regulation (EC) No 1893/2006, these activities are classified under the following NACE code [7]: 03.2.1 Marine aquaculture, and 3.2.2 Freshwater aquaculture.

Finfish aquaculture can make a substantial contribution to climate change mitigation, climate change adaptation, to the circular economy, to the protection and restoration of biodiversity and ecosystems and to social objective.

Finfish production in EU and the rest of Europe

[3] https://finance.ec.europa.eu/system/files/2022-03/220330-sustainable-finance-platform-finance-report-remaining-environmental-objectives-taxonomy-annex_en.pdf
[4] https://ourworldindata.org/grapher/land-use-protein-poore
[5] https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement
[6] https://environment.ec.europa.eu/publications/recommendation-use-environmental-footprint-methods_en
[7] https://nacev2.com/en/activity/agriculture-forestry-and-fishing

The total production in Europe of fish by aquaculture was estimated to be 2,570,650 tons in 2020, indicating a small increase of 2.8% in total production when compared to 2019. Marine cold-water species represent 70% of total production, freshwater species 14% and marine Mediterranean 16%. Norway remains the dominant producer in Europe with 58% of the total supply, mainly salmon but also large trout (>1.2 kg) production. The other countries that produce more than 100,000 tons annually are Turkey, United Kingdom and Greece. The main species produced are salmon, trout, seabream, seabass, and carp which represent 95% of the total European production in 2020 (FEAP[8]).

Between 2008 and 2018, the overall production in EU countries (without Norway, Turkey and others) seems to be rather stable slightly above 1.2 million tonnes. Shellfish production accounted for 54%, freshwater finfish 24% and marine finfish 22% of the total production in 2018. The total nominal turnover from the EU aquaculture sector was €3.9 and €4.1 billion in 2017 and 2018, respectively. The majority of the turnover at the EU level comes from marine finfish production (45%), while shellfish production accounts for 31% and freshwater finfish production 25% (STECF 20-12, EU Aquaculture Economics[9]).

According to the EU, aquaculture employs around 70,000 people across the continent, most of which are small businesses or micro-enterprises in coastal and rural areas[10].

3. Methods

The development of the Technical Screening Criteria and Indicators, and the identification of ways for substantial contribution is based on the structure in EU taxonomy, but also relevant EU regulation and recommendations including the EU Green Deal[11], the Farm to Fork Strategy, the EU strategic guideline for aquaculture (2021)[12], and the initiative for developing a Sustainable Food System.

The EU taxonomy defines criteria to substantiate significant contribution to the six environmental objectives listed in article 9[13]. This is supplemented with one objective concerning Social Sustainability in the structure for this work. Fish welfare is not included here but will certainly be relevant in future work.

Further the development of the Technical Screening Criteria and Indicators is based on existing relevant certification schemes, certification benchmarks (GSSI) and relevant sustainability EU methodologies such as the EU-PEF (Product Environmental Footprint)[14], the STECF report[15] and EU legislation.

GSSI (Global Sustainable Seafood Initiative) [16] has conducted a benchmark process and has recognized 9 certifications schemes which are in alignment with the FAO Guidelines for aquaculture and fisheries. For aquaculture these are[17]: ASC (Aquaculture Stewardship Council)[18], BIM Certified Quality Aquaculture

[8] Source FEAP https://feap.info/index.php/data/
[9] STECF 20-12 - EU Aquaculture economics.pdf
[10] https://oceans-and-fisheries.ec.europa.eu/facts-and-figures/facts-and-figures-common-fisheries-policy_en
[11] EU The European Green Deal, COM/2019/640 final
[12] https://oceans-and-fisheries.ec.europa.eu/ocean/blue-economy/aquaculture/aquaculture-guidelines_en
[13] Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32020R0852
[14] Recommendation on the use of Environmental Footprint methods 16.12.2021. annex, https://ec.europa.eu/environment/publications/recommendation-use-environmental-footprint-methods_en
[15] STECF 20,05, Criteria and indicators to incorporate sustainably aspect for seafood product in the marketing standards under the Common Marketing Organisation (Scientific, Technical and Economic Committee for Fisheries)
[16] https://www.ourgssi.org/benchmarking/
[17] https://www.ourgssi.org/gssi-recognized-certifcation/
[18] https://www.asc-aqua.org/what-we-do/our-standards/farm-standards/

(CQA)[19], BAP (Best Aquaculture Practice)[20], and MEL Japan. In this report the following are used: ASC, Global GAP, BAP, and BIM Certified Quality Aquaculture (CQA).

The work for developing Technical Screening Criteria and indicators took place in two steps. First for each of the 7 objectives, a gross list was made with proposals for Technical Screening Criteria and indicators based on the above-mentioned EU- and certification references. Based on this, 1) the potential contribution from the sector to the relevant environmental objective was identified, and 2) the most comprehensive Technical Screening Criteria were chosen to assess whether an activity will cause harm to the relevant environmental objective.

The criteria are as far as possible chosen as quantitative, or alternatively qualitative, and the knowledge from the different certifications scheme included. Further, no specific threshold level has been set in this work. Next step must be setting specific thresholds depending on production methods, species, and fish size. Setting thresholds must however be considered carefully due to the significant variation in production methods and species.

For identifying ways for substantial contribution, a screening procedure was conducted for each objective based on EU- and certification references and relevant literature.

Technical Screening Criteria and indicators to avoid harm to the environment are presented in chapter 5, and substantial contribution presented in chapter 4.

The concepts of Indicator compared to LCA

This document describes how aquaculture qualifies as contributing substantially to 5 of the objectives and proposes Technical Screening Criteria to avoid harm to any of the other environmental objectives.

In this document "indicator" means description of a specific activity contributing substantially to a given objective or an activity substantiating that aquaculture does not cause significant harm to any of the other environmental objectives addressed. It is also suggested ways to quantify the activity in itself or the outcome of the activity, for example the consumption of freshwater expressed as number of m^3 used per ton fish produced.

Another way to quantify/measure the indicators is to assess the environmental impact of the activity, and the outcome of an assessment is commonly called footprints, for example the climate footprint of the activity, process, company and/or product.

A LCA (Life Cycle Assessment) is defined as *compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle*[21]. There are several standards describing how to carry out LCA and the Commission has recommended the application of the Product Environment Footprint (PEF). The Commission points, among other things, at the following:

Reliable and correct measurement and information on the environmental performance of products and organisations is an essential element in the environmental decision-making of a wide range of actors. The Product Environmental Footprint and Organisation Environmental Footprint methods (hereafter 'Environmental Footprint methods') enable companies to measure and communicate their environmental performance and thereby compete on the market based on reliable environmental information. They contain

[19] https://bim.ie/aquaculture/sustainability-and-certification/certified-quality-aquaculture-cqa-programme/
[20] https://www.bapcertification.org/
[21] Commission Recommendation (EU) 2021/2279 of 15 December 2021 on the use of the Environmental Footprint methods to measure and communicate the life cycle environmental performance of products and organisations

detailed instructions on how to model and calculate the environmental impacts of products and organisations. The Environmental Footprint methods build on existing, internationally accepted practices, indicators and rules.

LCA, including PEF, is a method to quantify environmental impacts and thus to document how measures, for example **indicators,** contribute to environmental objectives.

Carrying out an LCA is a process implying quantification of a lot of inputs and outputs of a production as basis for the impact assessment. Thus, quantifying an input (for example water used per ton produced fish or kWh used per ton produced fish) is needed to calculate the various impacts. However, such quantified inputs might function as more simple barometers of potential environmental effects or environmental objectives, but without assessing the environmental impact. A LCA is an important method for knowledge of the footprint of a certain production, and for comparison the production with other animal protein sources.

4. Substantial contribution

Substantial contribution to climate change mitigation (objective 1)

According to the EU Taxonomy[22], economic activities should qualify as contributing substantially to climate change mitigation if their greenhouse gas emissions are substantially lower than the sector or industry average. Finfish aquaculture contributes to this objective as it has a significantly lower carbon footprint compared to land animal protein production (Clune et al., 2017; Gephart et al., 2021). As such, finfish aquaculture will play an important role in the transition to a more climate friendly diet, and by a transformation towards production methods which are more climate friendly.

The main contributors of greenhouse gas emissions in finfish aquaculture are embedded in feed and further in on-farm energy use. Subsequently, the emissions embedded in these components should be reduced further.

Substantial contribution to climate change adaptation (objective 2)

According to the EU Taxonomy[23], economic activities should qualify as contributing substantially to climate change adaptation where that activity contributes substantially to preventing or reducing the risk of the adverse impact of the current climate and the expected future climate on people, nature or assets, without increasing the risk of an adverse impact on other people, nature or assets.

With reference to the unbalance regarding the global food production between the use of land and the harvesting of biomass from the ocean, a shift in the diet to more seafood from finfish aquaculture can contribute significantly by reducing the negative impact of climate changes on food production. This is a way to drive advantage of the ecosystem service regarding food from the ocean.
Further, some types of aquaculture can help preserve ecosystems such as ponds or wetlands, and these ecosystems provide protection against climate-change impact such as sea level rise and floods and eutrophication[24].

Protection of water and marine resources (objective 3)

[22] EU 2020/852 preamble 41, art. 10
[23] EU 2020/852 preamble 41, art. 10
[24] EU Strategic guideline Aquaculture 2.1.4.

Avenue des Arts 56, 1000 Brussels (Belgium) | Tel. : +32 4 3382995 | secretariat@feap.info

Finfish (freshwater) aquaculture is highly depended on freshwater supply for its core processes. This makes industry vulnerable to water scarcity and droughts – especially when accelerated through climate change. Despite the industry' dependency on water, it is not considered a consumer of water, but a user, meaning that water is typically reverted back to natural systems after being used for production.

Less impactful production methods will have to reduce the overall water use in relation to biological and other anthropogenic needs, as well as optimise the quality of the discharged water in order to minimise eutrophication effects in the receiving water body. Compliance with established regulations like the Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD) form a fundamental basis. In addition, either through a regulatory framework already existing and /or voluntary certification schemes, impacts on benthic impact are addressed within the EU.

Substantial contribution to the transition to a circular economy (objective 4)

Circular economy[25] is an important cornerstone in the green transition set by the EU green Deal. Aquaculture can contribute substantially to circular economy by producing animal protein more efficiently than most other animal protein sources[26] and by further development in circular design and management.

Finfish aquaculture contributes to the circular economy by improvement in the efficiency in the use of raw materials and reducing the generation of by-product, by improving the energy efficiency, and by increasing the use of by-product and waste generated in other value chains[27]. Aquaculture is a leading example of a circular economy in the efficient and non-consumptive use of water, and the increasing reuse of nutrients and organic materials (fish-manure and dead fish) and other materials.

Innovation in both marine and land-based farm design and their equipment, facilitates the efficient non-consumptive use of water and energy resources as well as the use of by-product and the recovery potential of waste materials for recycling and use in other value chains.

Pollution prevention and control (objective 5)

The aquaculture sector has a particular role to play in contributing to the transition to sustainable food systems, but also by reducing pollution. As a result of operational activities, pollution effects can occur from aquaculture operations. Impacts are related to water quality, benthic impacts, chemicals, and other non-biological pollution.

Finfish aquaculture is strictly regulated in the EU, and a fish farm cannot get a new operation permit or any expansion if the effluent of nutrient, chemicals, medicine etc. harm nature, habitat-areas, and the receiving waterbodies. The receiving environment has to be protected by reduction in effluent, location management, implementation of technology, and farm management. Aquaculture should only be placed within the environment in such a way as to reduce long-term impact.

Substantial contribution to the protection and restoration of biodiversity and ecosystems (Objective 6)

[25] Taxonomy, art. 2.9. Definitions: 'circular economy' means an economic system whereby the value of products, materials and other resources in the economy is maintained for as long as possible, enhancing their efficient use in production and consumption, thereby reducing the environmental impact of their use, minimising waste and the release of hazardous substances at all stages of their life cycle, including through the application of the waste hierarchy;
[26] EU Strategic Guideline for aquaculture (2.2.1)
[27] EU Strategic guideline for aquaculture (2.2)

When properly managed, finfish aquaculture can contribute substantially to the environmental objective of protection and restoration of biodiversity and ecosystems by providing food and contributing to restocking of fish stocks and nature conservation.

Finfish aquaculture can contribute by closing the gap between the increasing demand of seafood on the market and the supply of seafood. Hereby aquaculture can reduce the pressure on the land and on wild stock, and thereby improving wild stock and ecosystems.
Finfish aquaculture activities notably those offering ecosystem services, can contribute to the protection and restoration of biodiversity and ecosystems and improving landscape. Aquaculture as extensive pond farming and "constructed" wetlands can contribute to this.

Substantial contribution to Social Sustainability (Objective 7)

Finfish aquaculture can contribute by producing safe and nutritious food, which is also environmentally and climate efficient. Finfish aquaculture can contribute with positive impact in local communities by job creation (direct and indirect) and supporting community facilities and infrastructure. Furthermore, finfish farming often is in rural areas often coastal or islands, where they can contribute substantially to the development of the society.

An important piece of the sustainability of aquaculture is an improved external support to the activity. Without this support (official EU, national and local), many small aquaculture businesses will disappear, and these businesses are often the ones that operate on small farms in depressed or developing areas.

The legal and economic support of European and local authorities is essential to promote the sustainability of the small and medium-sized aquaculture sector.

5. Technical Screening Criteria: Aquaculture

Description of the activity: These criteria cover aquaculture on a commercial basis in oceanic, coastal, or inland waters.

In accordance with the statistical classification of economic activities established by Regulation (EC) No 1893/2006, these activities are classified under the following NACE codes:

A3 - –Fishing and aquaculture
A3.2 - Aquaculture
A3.2.1 - –Marine aquaculture
A3.2.2 - –Freshwater aquaculture

Objective 1: Climate change mitigation

Technical Screening Criteria and Indicators	Rationale
Criteria 1.1: Carbon footprint at farm-level	For aquaculture CO_2 emission is often dominated by feed used.

Indicator 1.1.1: The aquaculture operator calculates (and discloses) the quantity of energy consumed (MJ per ton of farmgate production). Indicator 1.1.2: The aquaculture operator calculates (and discloses) the annual quantity of GHG emissions produced. In kg CO_2-eq per ton of farm-gate production; including emissions from feed and on-farm energy consumption and added (liquid) oxygen if relevant. Indicator 1.1.3: The aquaculture operator reduces the use of fossil fuel-based energy sources by improving energy efficiency or/and by increasing the proportion of renewable energy sources where applicable. Indicator 1.1.4: The aquaculture operator uses feed with a low GHG footprint, where possible (i.e., when it does not compromise other relevant sustainable production metrics such as feed efficiency, Fish Health & Welfare and social and economic risks).	Indicators for CO_2 footprint for feed and for energy use and transition to renewable energy on farm are included. Indicator 1.1.1 can be used as a baseline and can be compared with other food productions systems. Efficiency in energy use is included in objective 4 regarding circular economy. Recognized methods and standards should be used such as the GHG protocols[28]. STEFC suggested energy use in farm and carbon footprint (farmgate). **References:** EU-taxonomy art. 10, preamble 24, PEF, STECF, ASC, Global Gap, CQA, EU strategic guideline.

Objective 2: Climate change adaptation

Technical Screening Criteria and Indicators	**Rationale**
Criteria 2.1: Adaptation to climate change (managing threats) Indicator 2.2.1: The aquaculture operator conducts periodic mapping of climate change related risks to the farm (e.g., drought/flood risk, disease presence) and implements mitigating actions accordingly.	Important to identifying physical and transitional risks (and opportunities) and mitigation actions. Make a list of climate related hazards/negative effects on aquaculture and possible solutions. Solutions could be selective breeding, new species, land-based solutions (RAS), polyculture, prevention of new diseases, water saving systems, flood prevention, other innovations and innovative solutions, escape prevention. **References**: Taxonomy art. 11, preamble 25, EU Guideline Aquaculture.
Criteria 2.2: Adaptation to climate change (exploiting opportunities)	It is important to identify climate adaptation opportunities. Screening which climate change related positive effects occur. For example:

[28] https://ghgprotocol.org/standards

Indicator 2.2.1: The aquaculture operator conducts periodic mapping of climate change related opportunities to the farm (e.g., extension of growth season, consumer awareness to climate-friendly food) and implements actions to benefit from the opportunity.	extended growing season, new species, new habitats, reduced costs linked with energy efficiency, increasing awareness of consumers for low carbon footprint diets, labels etc. **References:** Taxonomy art. 11, preamble 25, EU Guideline Aquaculture.

Objective 3: The sustainable use and protection of water and marine resources

Technical Screening Criteria and Indicators	**Rationale**
### Criteria 3.1: Water resource protection Indicator 3.1.1: The aquaculture operator demonstrates that water abstraction has no significant negative impact on 1) the vital flow of the used surface water, and/or, 2) the groundwater levels nor salinity levels of groundwater. Indicator 3.1.2: The aquaculture operator calculates, at a minimum the following data: Total Nitrogen discharge, Total Phosphorus discharge and Biochemical Oxygen Demand (BOD) kg per produced ton fish and in total. For marine sites located in areas where the water body is classified as good very good by the water framework directive, only BOD calculation is required (e.g., ASC standard).	Most aquaculture facilities can be considered as non-consumptive water users but should endeavor to reduce biological and chemical changes in the receiving water body. Further, aquaculture facilities should avoid negative impacts of over-abstraction of water e.g., water deficit in streams and lakes, water level in groundwater etc. Marine aquaculture systems are inherently efficient, but production facilities should operate within the assimilative capacity[29] of the environment where they operate. The total effluent and the efficiency of N, P and BOD per unit (kg) of fish produced should be calculated using mass balance. Calculations can be aligned with land-based farming by a comprehensive monitoring program. Effluent management, emission in water is suggested by STECF. **References:** Taxonomy art. 12, preamble 26, ASC, Global Gap, BAP, STECF.
### Criteria 3.2: Efficient use of freshwater Indicator 3.2.1: The aquaculture operator calculates the freshwater use (m3/ ton fish produced), categorized by source (surface waters, third party waters and groundwater).	Most aquaculture facilities can be considered as non-consumptive water users but should endeavor to reduce biological and chemical changes in the recipient environment. Marine water resources aren't included in the criteria because they are usually not subjected to a limited resource. In addition, extensive pond farming should be exempted from this indicator.

[29] Assimilative capacity is the ability for "pollutants" to be absorbed by an environment without detrimental effects to the environment or those who use it.

	References: Taxonomy art. 12, preamble 26, ASC, Global Gap.

Regulation: EU 2000/60/EF Water frame directive, EU 2008/56/EF Marine Strategy framework directive.

Objective 4: The transition to a circular economy

Technical Screening Criteria and Indicators	**Rationale**
Criteria 4.1: Optimising the use of by-products in feed. Indicator 4.1.1: The aquaculture operator uses feed in which the inclusion of by-products is optimised, e.g., a yearly report from the feed manufactures concerning the use of by-product in feed.	The purpose of this criteria is to encourage the aquaculture operators to optimise the use of by-products in feed, which is an important goal for the industry if it does not compromise fish health and welfare, quality, and growth performance, and only if other raw ingredients are not more sustainable in terms of climate impact, land use, environment etc. "Novel" feed raw materials, for example zooplankton, insects, microorganisms, and fermented vegetables, should also be assessed from economic, social, and environmental perspectives, as a way to either replace existing feed raw materials or to extend the existing basket of feed raw materials. Since feed composition and the use of ingredients depends on several factors such as fish species and size, availability of the ingredients, social and environmental-impact, climate-impact, fish welfare and growth performance etc., it is not realistic and not sustainable to set fixed thresholds. The proposed indicator focuses on the transition to a more circular economy. Further GHG from feed is a criterion in 1.1.4, N and P efficiency is a criterion in 3.2.1, and sustainable ingredients is a criterion in 6.4.1. **References**: Taxonomy art. 13, preamble 27, 28; ASC; Global GAP and BAP.

Criteria 4.2: Efficient energy use Indicator 4.2.1: The aquaculture operator implements an energy efficiency plan (design and management).	Energy efficiency is an indicator of resource use. Energy consumption can be reduced by improved design and management of a plant. Indicator 1.1.1 set up an indicator for energy use per amount of production, therefore it is not repeated as an indicator here. **References:** Taxonomy art. 13, preamble 27, EU Strategic Guideline Aquaculture, STEFH, PEF, ASC
Criteria 4.3: Reduce, reuse & recycle waste, and optimise by-product use (circular design) Indicator 4.3.1: The aquaculture operator reports by-product and waste used as raw material in other value chains. Indicator 4.3 2: The aquaculture operator implements initiatives leading to re-use and/or recyclability of waste products where possible. Indicator 4.3.3: The aquaculture operator reports on responsible use of plastic (the '3R Principle': reduce, reuse, and recycle).	Circular Design is intelligent "circular" design of farms and equipment, to allow improved efficiency in production and energy use, improved animal welfare, facilitate the use of resources and recyclability of by-product and minimize waste. Aquaculture production systems need to be designed and managed with a focus on circular design. There are multiple ways of optimising by-product use, recycling, and reducing waste in aquaculture. The possibilities are dependent on the methods of farming and the farmed species. Dead fish can be used in biogas or used for recycling as an ingredient; fish-manure or fish-sludge can be used as fertilizers or compost in agriculture or as a source of energy as biogas; trimmings from slaughtering process can be upcycled to fish meal and fish oil used for other aquaculture species, as pet food or even as human supplements. Optimise design and management for retention and storage of nutrients (feed, fish sludge/fish manure, dead fish). Optimise the use and management of plastic: promote recyclability and reusability of packaging, reuse nets, etc. Demonstrate proper use of waste management infrastructure, and thereby increase preparation for waste reuse and recycling. **Reference:** Taxonomy art. 13, preamble 27, EU Strategic Guideline Aquaculture.
Criteria 4.4: Solid waste management plan	Having a waste management plan will allow the activity to identify sources of pollution and

Indicator 4.4.1: The aquaculture operator implements a waste management plan which includes the following, as a minimum: a) the identification of waste products and possible sources of pollution, b) proper waste storage and separation which ensures a responsible handling of hazardous material, and c) a waste reduction plan.	minimise its environmental impact while at the same time, promote re-usability, recyclability, and circularity of waste products. Solid waste management is also suggested by STECF. **References:** Taxonomy art. 13, preamble 27, EU PEF, EU Strategic guideline Aquaculture, STECF, ASC, Global Gap, Organic, GSSI. CQA.

Regulation: EU directive 2008/98/EF (waste-hierarchy), EU directive 94/62/EF (packaging), EU Closing the loop, An EU action plan for the Circular Economy, 2.12.2015; European Strategy for Plastics in a Circular Economy,16.1.2018.

Objective 5: Pollution prevention and control

Technical Screening Criteria and Indicators	Rationale
### Criteria 5.1: Organic enrichment, water quality and chemical discharge Indicator 5.1.1: The aquaculture operator conducts an Environmental Screening and if there is a significant impact an Environmental Impact Assessment (EIA) to guide location and activities of farms so that considered environmental impacts are minimised[30] (following EU regulation). Indicator 5.1.2: The aquaculture operator monitors benthic conditions following EU and/or national regulations. Indicator 5.1.3. The aquaculture operator uses only licensed medicines prescribed by veterinarians (or approved health personnel where applicable). Indicator 5.1.4: The aquaculture operator uses only approved chemicals (e.g., for anti-fouling or cleaning/ disinfection purposes).	Managing organic waste and chemical discharge to freshwater and marine environments (through uneaten feed and/or faeces and/or medicines and/or copper as anti-fouling paints and/or other chemicals used for disinfection etc.) should be managed to ensure no cumulative impact. In this objective the focus is on Environmental Screening/EIA, benthic impact, and proper use of medicines and chemicals. Air pollution is not applicable to the aquaculture sector. The impact of finfish aquaculture regarding pollution due to excess nutrient and hazardous substances can be assessed by an EIA. Further a criterion concerning the use of only approved medicine and chemicals, should ensure no use of non-approved substances. EIA and therapeutic treatment are also suggested by STECF. **References:** Taxonomy art. 14, preamble 29, EU PEF, EU Strategic guideline, STECF, ASC, Global Gap, Organic, CQA.

Regulation: EU Action plan: Towards zero pollution for air, water and soil; EU Water Frame Directive 2000/60/EC, EU Marine Strategy Frame Directive 2008/56/EC, EU Environmental Impact Directive 2011/92/EU (Directive 2014/52/EU amending Directive 2011/92/EU).

[30] EU Directive 2011/92/EU, Article 4.2.

Objective 6: The protection and restoration of biodiversity and ecosystems

Technical Screening Criteria and Indicators	Rationale
Criteria 6.1: Biodiversity, protected area and protected species. Indicator: 6.1.1: A habitat screening/assessment has been carried out which shows that there will be no adverse effect on the integrity of the concerned species and ecosystems (e.g.: Natura 2000, RAMSAR, National protected area and species, IUCN listed species, etc.)[31]. Indicator: 6.1.2: The aquaculture operator, where possible, identifies means to provide habitats to enhance biodiversity at the site level (such as the greening of land area or maintaining noncommercial stocked ponds for migrating birds). Criteria 6.1.3: The aquaculture operator does not introduce new Invasive Alien Species unless assessed to be low risk for the receiving environment.	Ensuring that an aquaculture activity does not cause any harm to the biodiversity or protected species or habitats. The habitat rules are already implemented in the EU-countries securing that aquaculture does not harm biodiversity and ecosystems. Due to the EU regulation (Bird- and Habitat directives) the authorities must carry out a habitat screening/assessment for all activities, and a finfish farm can only get permission if the activity does not adversely affect any protected area, and species. Although a proper habitat Screening/assessment has to be carried out, a criterion regarding Invasive alien species is included. EU definition for Invasive alien species[32]: 'invasive alien species' means an alien species whose introduction or spread has been found to threaten or adversely impact upon biodiversity and related ecosystem services. In addition, a criterion has been included regarding positive contribution to biodiversity and ecosystems. **References:** Taxonomy art 15, preamble 31, ASC, STECF, EU Strategic guideline.
Criteria 6.2: Escape prevention Indicator 6.2.1: The aquaculture operator implements escape prevention measures, based on an escape risk assessment, including stock accounting. Indicator 6.2.2: The aquaculture operator establishes a training program for all employees handling fish on escape prevention and mitigation.	Minimising escape incidents of farmed stock is important to avoid the potential genetic stock alterations and interbreeding with wild populations and/or potential environmental impact. For native species the genetic makeup of their offspring may be less suited to surviving and thriving in the wild.

[31] Habitat Directive (92/43/EEC) Article 6.3,

[32] No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species, Art.3.2).

Indicator 6.2.3: The aquaculture operator uses farming equipment that is 1) fit for purpose and certified using technical national standards where available, 2) inspected regularly, maintained, and repaired according to the documented procedure and/or when necessary. Indicator 6.2.4: The aquaculture operator records all escaped and unaccounted loss for all sites under their control. Indicator 6.2.5 The aquaculture operator have a Recapture plan for escaped fish.	Escapes can further impact wild populations by competing with them for food, habitat, and spawning partners. Escapes can cause impact both for non-native and native farmed fish. To lower the impact or risk if escapees happened, a recapture plan is considered. Escapes is also suggested by STECF. **References:** Taxonomy art. 15, ASC, Global Gap, BAP, STEFC
Criteria 6.3: Predator control Indicator 6.3.1: The aquaculture operator implements an effective predator control plan including prevention measures. Indicator 6.3.2: The aquaculture operator records all predator mortality events (mortalities, species, etc.). Indicator 6.3.3: The aquaculture operator trains all relevant staff for handling predators on site. Indicator 6.3.4: The aquaculture operator shall not intentionally kill threatened or protected species unless direct human safety is at risk and/or farmed animal welfare is severely compromised.	To secure a minimum interaction with wildlife, a criterion regarding predator control is included. Wildlife interaction in all forms of deliberate capture or killing, injury or harassment of predators on purpose should generally be avoided (Such as seals, dolphins, sharks, seabirds, etc.), unless direct human safety is at risk and/or farmed animal welfare is compromised. The proposed indicators should secure minimum interaction with wildlife. **Reference:** Taxonomy art. 15, ASC, Global Gap, BAP.
Criteria 6.4 Feed raw material production Indicator 6.4.1: The aquaculture operator uses feed in which marine raw materials are sourced from sustainable sources. Indicator 6.4.2: The aquaculture operator uses feed in which only deforestation-free soy should be used.	Marine raw materials in feed must be from sustainably fisheries according to the GSSI benchmark [33] and equivalent (e.g., MSC, Marine Trust, Fisheries Improvement Programs). STECF also suggest both marine and agriculture ingredients from sustainable sources. **References:** Taxonomy art. 15, ASC, STECF.

[33] www.ourgssi.org

Regulations: Biodiversity Strategy, Habitat Directive (92/43/EEC), Bird Directive (2009/147/EF), Directive on invasive alien species EU 1143/2014[34], EU regulation 708/2007 concerning use of alien and locally absent species in aquaculture.

Objective 7 Social Sustainability

Technical Screening Criteria and Indicators	Rationale
Criteria 7.1: Compliance with workers' Legal Rights Indicator 7.1.1: Disclosure of specific company policy and procedure for implementing worker's legal rights.	Compliance and understanding with ILO 8 conventions[35], SDG[36] and European Pillars of Social Rights[37] is central, and therefore disclosure of a specific company policy and procedure is recommended. The policy must include rights awareness, freedom of Association, right to Organize and collective Bargaining, no forced labor, child labor, equal remuneration, gender equality, discrimination etc. Even labor legislation in the EU countries and other initiatives should be a guarantee for compliance with the above, a specific company policy and procedure is central. **References**: EU taxonomy preamble 35, ASC, BAP.
Criteria 7.2: Worker's health and safety Indicator 7.2.1: Health and safety plan and procedure.	A safe working place for the employees is essential. Therefore, it is important to focus on health and safety for employees. E.g., the use of Personal Protection, Occupational injury insurance, workplace assessment and training. A health and safety plan, and an implemented procedure, renewed at least annually, could demonstrate compliance. **References:** EU Taxonomy preamble 35, ASC.

[34] Regulation: No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive
[35] https://www.ilo.org/global/standards/introduction-to-international-labour-standards/conventions-and-recommendations/lang--en/index.htm
[36] https://sdgs.un.org/goals
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Avenue des Arts 56, 1000 Brussels (Belgium) | Tel. : +32 4 3382995 | secretariat@feap.info