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Integrated Farm Assurance

Guideline for Aquaculture

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1 GUIDELINE AQ I – EXAMPLES OF ENVIRONMENTAL IMPACT ASSESSMENT (EIA), ENVIRONMENTAL RISK ASSESSMENT (ERA), AND RESPECTIVE ENVIRONMENTAL MANAGEMENT PLANS (EMPS)

Table A Example of EIA combined with the EMP (impacts inherent to farming operations; levels 4–7 in stages of impact assessment)

	Impact	Applicable law	Working instruction
1	Disposal of empty food bags	Municipal license	Dispose of empty food bags weekly on municipal dump
2	Discharge of sludge	E.g., province regulation on coastal protection 2003	Use settling pond; clean every two months
3	Disposal of settled sludge	Municipal license; directive on fertilizers in agriculture	200 metric tons/year of sludge can be brought to the rubber tree farms; Bring excess sludge to municipal dump
4	Use of electricity	None	Only use paddle wheels in accordance with working instruction on oxygen in ponds
5	Exhaust gases generator	E.g., government regulation 23/568 on exhaust gases	Dealer shall perform yearly check on engine adjustment
6	Pesticides for weed control	Product permits/approvals; application instructions	E.g., only use “Herbclean” once a month according to working instructions
7	Use of diesel fuel	None	Generator only uses diesel. See 4 and 5
8	Noise of the generator to surrounding neighbors	Municipal permit; agreement with neighbors	Keep doors of generator housing closed. Use ventilator at high room temperatures

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Table B Example of ERA combined with the EMP (realistic risks associated with farming operations)

	Risk	Applicable law	Preventive action
1	Empty food bags blown with the wind	Municipal license	Always close the container
2	Sludge floating instead of settling; discharge into nature	E.g., province regulation on coastal protection 2003	Stop discharge and clean settling pond
3	Excessive sludge production	None	Assess pond biomass; recalculate feeding regime
4	Leakage of fluid chemicals from the storage room	Municipal license	Store all fluids on dedicated storage devices
5	Diesel spilled onto/leached into the ground	Municipal license	Store diesel in an approved tank on concrete floor; filling only under supervision

Table C Example of biodiversity impact assessment (impacts inherent to farming operations)

	Impact	Ecological consequence	Mitigation
1	Conversion of natural habitats	Loss of fish breeding ground, endangered species habitat	Consider alternative sites
2	Nutrient/organic matter/sludge release to surrounding ecosystem	Additional growth of weed and algae; oxygen depletion of bottom (dependent on tidal flow to avoid build-up of concentrations)	Settlement ponds; limiting water exchange
3	Leaching of seawater into the ground	Salinization of ground water; change in vegetation on site and downstream towards the sea	No use of ground water for ponds; yearly monitoring of surrounding ground water
4	Release of pathogens	Endangering native species	Prevention of escapes; effluent handling

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Table D Example of biodiversity risk assessment and management plan (realistic risks to biodiversity associated with farming operations)

	Impact	Ecological consequence	Mitigation
1	Fish or shrimp escape	Introduction of unwanted species or pathogens threatening native species	Prefer native species; utmost precautions should be in place to prevent escapes
2	Flooding of settling pond (e.g., by storm or spring tide)	Significant change in habitat in recipient water	Dikes should be of above average height
3	Release of large quantities of chemicals	Damage to aquatic life in recipient water	Ensure adequate storage; avoid excessive chemical stocks

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2 GUIDELINE AQ II – BIODIVERSITY IN ENVIRONMENTAL IMPACT ASSESSMENT[1]

Introduction

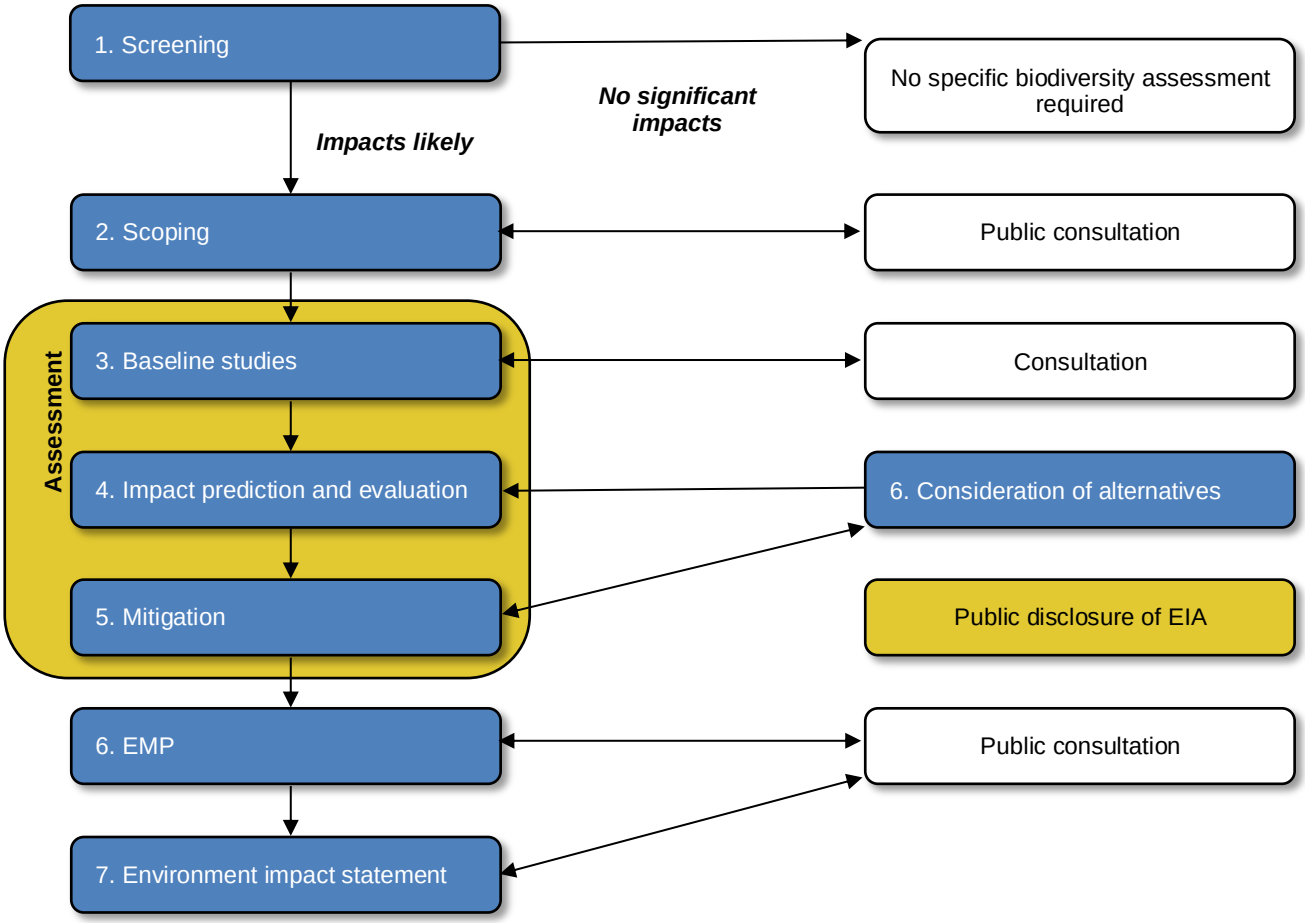
The Convention on Biological Diversity defines biodiversity as "the variability among living organisms from all sources including, amongst others, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems."

Biodiversity in more simple terms is the variety of life on earth at all levels, from genes to worldwide populations of the same species; from communities of species sharing the same small area of habitat to worldwide ecosystems.

Environmental impact assessment (EIA) provides opportunities to ensure that biodiversity values are recognized and taken into account in decision-making. Importantly, this involves a participatory approach with people who may be affected by a proposal (those living on or around the site). The participatory approach and stakeholder feedback are also key indicators as to the quality and credibility of the assessment.

[1]For key reference documents, see International Association of Impact Assessment (IAIA).

Figure A An overview of the principal stages of an EIA relevant to biodiversity



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Operating principles

1. Screening – to determine whether a proposal should be subject to an EIA or not, and if so, at what level of detail.

Use screening criteria that include biodiversity to determine whether important biodiversity resources may be affected. Biodiversity screening "triggers" for EIA should include:

- Potential impacts on protected areas and areas supporting protected species
- Impacts on other areas that are not protected but are important for biodiversity (see the following list regarding high conservation value areas)
- Activities that pose a particular threat to biodiversity (in terms of their type, magnitude, location, duration, timing, reversibility)
- Areas that provide important ecosystem services including indigenous people's territories, wetlands, fish breeding grounds, soils prone to erosion or acidification, relatively undisturbed or characteristic habitats, flood storage areas, and groundwater recharge areas, etc.

Encourage the development of a biodiversity screening map indicating important biodiversity values and ecosystem services. If possible, integrate this activity into the development of a national biodiversity strategy and action plan (NBSAP) and/or biodiversity planning at subnational levels (e.g., coastal zone management plans in regions, local authorities, towns) to identify conservation priorities and targets.

Areas of high conservation value are areas that:

- Support endemic, rare, or declining habitats/species/genotypes
- Support genotypes and species whose presence is a prerequisite for the persistence of other species
- Act as a buffer, linking habitat, or ecological corridor, or play an important part in maintaining environmental quality
- Have important seasonal uses or are critical for migration
- Support habitats, species populations, or ecosystems that are vulnerable, threatened throughout their range, and/or slow to recover
- Support particularly large or continuous areas of previously undisturbed habitat
- Act as a refuge for biodiversity during climate change, enabling the persistence and continuation of evolutionary processes
- Support biodiversity for which mitigation is difficult or its effectiveness unproven, including habitats that take a long time to develop characteristic biodiversity
- Are currently poor in biodiversity but have the potential to develop high biodiversity with appropriate intervention

2. Scoping and 3. Baseline study – to identify the issues and impacts that are likely to be important and to establish terms of reference for the EIA.

Use scoping as an opportunity to raise awareness for biodiversity concerns and discuss alternatives to avoid or minimize negative impacts on biodiversity.

It is good practice to produce a scoping report for consultation. This should address the following issues (on the basis of existing information and any preliminary surveys or discussions):

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1. The type of project, program, plan, or policy, possible alternatives, and a summary of activities likely to affect biodiversity
2. An analysis of opportunities and constraints for biodiversity (include “no net biodiversity loss” or “biodiversity restoration” alternatives)
3. Expected biophysical changes (in soil, water, air, flora, fauna) resulting from proposed activities or induced by any socioeconomic changes
4. Available information on baseline conditions
5. Likely biodiversity impacts associated with the proposal in terms of composition, structure, and function
6. Biodiversity services and values identified in consultation with stakeholders and anticipated changes in these (highlight any irreversible impacts)
7. Possible measures to avoid, minimize, or compensate for significant biodiversity damage or loss, making reference to any legal requirements
8. Proposed EIA methodology and timescale

4. Impact prediction and evaluation – to determine the potential harm caused.

Address biodiversity at all appropriate levels and allow for enough survey time to take seasonal features into account. Focus on processes and services that are critical to human well-being and the integrity of ecosystems. Explain the main risks and opportunities for biodiversity.

Questions to ask:

At the gene level, to what extent will the proposal have significant effects on:

- Opportunities for species populations to interact, e.g., by increasing habitat fragmentation and isolation
- Risk of extinction

At the species level, to what extent will the proposal:

- Affect species identified as priorities in NBSAPs and/or subnational biodiversity plans (e.g., Red List species)
- Increase the risk of invasion by alien species

At the ecosystem level, to what extent will the proposal:

- Change the amount, quality, or spatial organization of habitat
- Damage ecosystem processes and services, particularly those on which local communities rely

Finally:

- If habitats will be lost or altered, are alternative habitats available to support associated species populations?
- Are there opportunities to consolidate or connect habitats?

Take an ecosystem approach and involve relevant stakeholders (including local communities). Consider the full range of factors affecting biodiversity. These include direct drivers of change associated with a proposal (e.g., land conversion and vegetation removal leading to loss of habitat – a key driver of biodiversity loss, emissions, disturbance, introduction of alien and genetically modified species, etc.) and indirect drivers of change that are harder to quantify, including demographic, economic, sociopolitical, cultural, and technological processes or interventions.

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Evaluate impacts of alternatives with reference to the baseline situation. Compare with thresholds and objectives for biodiversity. Use NBSAPs, subnational biodiversity plans, and other conservation reports for information and objectives. Take into account cumulative threats and impacts resulting from repeated impacts of projects of the same or different nature over space and time, and from proposed plans, programs, or policies.

5. Mitigation – to determine the framework for preventing or at least minimizing harm.

Remedial action can take several forms: Avoidance (or prevention), mitigation (including restoration and rehabilitation of sites), and compensation. Apply the "positive planning approach", in which avoidance has priority and compensation is used as a last resort. Avoid "excuse"-type compensation. Look for opportunities to positively enhance biodiversity. Acknowledge that compensation will not always be possible; there will still be cases where it is appropriate to say "no" to development proposals on grounds of irreversible damage to biodiversity.

6. Review and decision-making – to assess the suitability of the framework for harm prevention.

Where biodiversity impacts are significant, a specialist with appropriate expertise should undertake a peer review of environmental reports.

Depending on the level of confidentiality of public decision-making, consideration should be given to the involvement of affected groups and civil societies. Avoid pitting conservation goals against development goals; balance conservation with sustainable use for economically viable and socially and ecologically sustainable solutions.

For important biodiversity issues, apply the precautionary principle where information is insufficient, and the "no net loss" principle in relation to irreversible losses associated with the proposal.

7. Environmental management plan (including monitoring, evaluation, and auditing plans) – to determine how to move forward.

It is important to recognize that the prediction of biodiversity response to perturbation is uncertain, especially over the longer term. Management systems and programs, including clear management targets (or limits of acceptable change) and appropriate monitoring, should be in place to ensure that mitigation is effectively implemented, unforeseen negative effects are detected and addressed, and negative trends are identified as early and quickly as possible. Provision is made for the regular auditing of impacts on biodiversity. Provision should be made for emergency response measures and/or contingency plans where upset or accident conditions may threaten biodiversity.

8. Environmental impact statement – to provide transparency and opportunities for dialogue.

One of the most effective ways to ensure that an EIA is fair and credible is through full and public stakeholder engagement with all affected and interested parties and the public disclosure of environmental impact statements.

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3 GUIDELINE AQ III – ENVIRONMENTAL PARAMETERS OF RELEVANCE BASED ON THE AQUACULTURE SYSTEM USED

When referring to the environmental impact of aquatic food production, a distinction should be made between *fed/fertilized* aquaculture and non-fed, or *extractive*, aquaculture. Examples of the latter are seaweed culture or shellfish culture: The farmed organisms are not fed and grow using the naturally available nutrients (algae/seaweed) or food (shellfish). The latter systems may still have an impact on the environment via the (human-based) operational activities, such as fuel needed for boats, engines, equipment, materials disposed of (e.g., ropes used for the shellfish lines), etc., but the farmed organisms do not generate environmental (nutrient) enrichment above natural levels. Their impact potentially alters the natural environment mainly by clearing the surrounding water of particles (causing light penetration changes), affecting the species composition of the phytoplankton in the water around the shellfish production sites, concentrating dissolved and suspended matter on the sea floor through the deposition of pseudofeces, etc.

The situation is very different in production systems using feeds or fertilizers. Most of the discharged organic matter, nitrogen, and phosphorus in these systems originates from the feed. As any animal growth process occurs with a certain degree of inefficiency, all animal food production systems, terrestrial or aquatic, produce a significant amount of waste. Mass balance studies show that typical retention rates in fish vary from 35–45% of the supplied feed carbon (C), and 30–40% and 10–16% of the feed nitrogen (N) and phosphorus (P), respectively. The remaining parts are excreted, either via feces (solid waste) or via the gills (dissolved waste). Open systems such as net enclosures or raceways, but also semi-closed systems, such as ponds with a water renewal rate of 15%/day (for example) discharge most of the excreted waste directly to the outside environment. Literature reports that for net enclosures, 40–80kg N and 3–10kg P are discharged into the environment per metric ton of fish produced. However, the impact is usually local, and effects are hardly detectable at a distance of 100–200m from the cages.

In more closed systems, such as stagnant ponds and recirculating aquaculture systems (RASs), part of the excreted waste remains within the system, where it affects the within-system ecology and water quality. For instance, solid waste may sink to the bottom of the pond, where it is converted by the local microbial community or even immobilized; dissolved nitrogen and phosphorus may be assimilated by the phytoplankton community in the pond, and so on. The advantage of RASs is that they have a semi-closed water loop, reducing the amount of discharged effluents enormously. However, in general, RASs do not immobilize waste products. Solid waste is collected and still needs to be discharged. Unless a denitrification reactor is used, nitrogen losses are converted into less toxic nitrate, which is partly discharged. To avoid eutrophication into receiving water bodies, some countries require farms with RAS to discharge their effluent into the regular sewage system, so that it can be treated in municipal wastewater treatment plants. The latter is not possible for marine farms with RAS because of the saline water.

However, taking into account the growth of aquaculture globally and the clustering of farms in certain regions, the collective amount of organic carbon, nitrogen, and phosphorus discharged by these farming activities can be significant, even when on-farm mitigation procedures are applied. Even if its local impact is not always noticeable, the sheer total volume of waste excretion by aquaculture warrants social awareness and a search for more sustainability. The local risk of the environmental impact of aquaculture depends on a complex range of factors which together may determine whether the impact is measurable, moderate, or significant.

Source: Consultancy provided by Prof. Dr. Johan Verreth, expert on ecological fish farming sustainability.

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Ratio BOD_5/COD

BOD refers to the biochemical oxygen demand of microbial organisms for the biodegradation of organic matter. It is calculated from the oxygen decrease in a water sample (in a BOD bottle, kept in the dark) at 20ºC after a period of 5 days. COD additionally incorporates the chemical oxygen demand for the chemical degradation of (organic plus inorganic) products. Therefore, COD levels are always higher than BOD_5 values. The ratio BOD_5/COD helps determine the biodegradability of the waste; in wastewater treatment, a ratio below 0.4 is considered poorly degradable. As COD measurements are sensitive to salinity, following the APHA method for COD analysis in seawater is recommended. BOD is a useful indicator for the impact of farm effluent on the receiving water body, as it gives an estimation of the amount of oxygen required to oxidize the organic matter discharged via the effluent. The impact on the receiving water bodies depends not only on the concentration in the effluent, but also on the amount of water discharged per day or per week, and on the absorption capacity of the receiving water body. A confined lake or bay has a lower absorption capacity than a river with high water flow or than an open ocean environment. For example, for marine and coastal farms, the local water currents and exchange may dilute the concentrations significantly, hence the impact of the BOD_5 discharge may be limited. However, in highly protected areas, its effect may still be measurable.

	Net enclosures	**Ponds**	**RASs (incl. hatcheries)**	**Flow-through systems**
Risk of env. impact	Low	Moderate to significant	Significant	Significant
Typical values	Typical aquaculture effluents have a BOD_5 ranging between 5 and 30mg/l; if there is a risk of industrial pollution, it is wise to measure the COD as well; normally the BOD_5 is about 60–65% of the COD; a ratio below 40% indicates more chemical than organic pollution.			
Frequency	Monthly, when in full operation	At the end of the production cycle	Monthly, when in full operation	Monthly, when in full operation
Where to sample	During feeding outside the pen, and at the lowest possible part	At the outlet of the pond, or in the drainage channel	At the discharge tube	At the outlet of the tank or in the drainage channel/tube

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CO_2

High levels of free CO_2 may impair the growth, health, and welfare of the farmed aquatic species, as CO_2 reduces pH and impairs the oxygen uptake capacity of the aquatic species. It can be mitigated by strong aeration or by adding sodium, magnesium, or calcium (bi)carbonate salt. Natural levels of free CO_2 range between 5 and 10/15ppm. 20ppm is considered the maximum threshold for good aquaculture water quality, yet this figure should be treated flexibly. In intensive farms, especially in RASs, it can even increase to levels of 25–40ppm. In natural water, free CO_2 is seldom a problem as it is in equilibrium with the bicarbonate/carbonate buffer system. Alkalinity is a suitable parameter for estimating the strength of this buffer system. As long as pH in the water remains above 6.5, the risk of free CO_2 levels in natural water being too high is always limited. Problems with free CO_2 occur mainly in the culture water of intensive closed production systems and need to be managed as part of the farm operation.

	Net enclosures	**Ponds**	**RASs (incl. hatcheries) and flow-through systems**
Risk of env. Impact	Low	Low	Low
Typical values	5–10ppm	CO_2 levels show diel (diurnal) fluctuations with maximum levels at sunrise and minimum levels at sunset; liming may help adjust the water alkalinity	In intensive systems where pure oxygen is added (e.g., RASs, some flow-through systems), free CO_2 levels may be elevated. Levels should not be much higher than 20–30ppm. Mitigation involves managing pH and degassing; the gas/liquid ratio in the stripping systems should preferably be around 5; CO_2 removal may increase pH; care should be taken to keep the latter under 7–7.5 to avoid ammonia accumulation to toxic levels; adding sodium or calcium carbonate can help maintain pH levels within the proper range.
Frequency	Incidentally	Incidentally	High (daily or a few times per week)
Where to sample	Inside the pen	Water column sample	RASs: in the sump tank Flow-through systems: near the outlet

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H_2S

H_2S is produced by sulfuric bacteria in anaerobic conditions by reduction of sulfates. Its presence is usually related to anaerobic patches in pond sediments, in denitrification units, or anywhere else where anaerobic patches may be created (e.g., in pipes, etc.). As sulfates are more elevated in seawater (up to 2700ppm) than in freshwater (typically around 2ppm), H_2S problems occur more easily in marine farms. The production of H_2S is impaired by high oxygen or nitrate levels; high pH also reduces the concentrations, as H_2S exists in a pH-related equilibrium with HS^-. As a consequence, keeping dissolved oxygen levels in the water high is crucial to minimizing H_2S problems. Concentrations of 0.002ppm (freshwater) to 0.005ppm (seawater) can impair health and welfare. Marine species are more tolerant than freshwater species. The LC50 values for marine fish are 50–200ppm.

	Net enclosures	**Ponds**	**RASs (incl. hatcheries)**	**Flow-through systems**
Risk of env. impact	Low	Low	Low to moderate	Low
Typical values	From undetectable to 7ppm (e.g., in an anoxic area of the Black Sea)	0.1–0.2 ppm (in anaerobic patches)	25–100ppm (in anaerobic conditions)	From undetectable to 0.05ppm
Frequency	Incidentally	Incidentally	High (daily or several times per week)	Incidentally
Where to sample	Inside the pen	10cm above the bottom	In the biofilter and in the sump tank	Near the outlet

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NH_4-N, NO_3-N and NO_2-N

The catabolic end product of protein utilization is ammonia, which is excreted by the fish. In water, ammonia can be taken up by algae and, if discharged, constitute a major factor causing eutrophication. For production systems in open air, total ammonia levels are limited due to assimilation by phytoplankton. In closed systems such as RASs, it is essential to convert the toxic ammonia into nitrite and subsequently to the less toxic nitrate using a nitrification bacterial reactor. Under proper conditions, nitrite concentrations will remain low while nitrate levels accumulate. In pond water or surface waters receiving farm effluents nitrate can also be absorbed by algae and thus contribute to eutrophication, but normally the absorption of ammonia by algae will reduce its availability for nitrification. In RASs, the water renewal rate (and thus discharge of effluent) is often geared to keep system nitrate-N levels below 100ppm. If a denitrification reactor is added to the RAS, nitrate can be converted into nitrogen gas, which can be stripped to the air, reducing the risk for eutrophication due to nitrogen emissions in the effluent. Based on recent scientific literature, chronic exposure to this concentration is considered safe for the health and welfare of the farmed aquatic species. However, its discharge into the environment can contribute to eutrophication. The impact of the discharge of the various dissolved inorganic nitrogen (DIN) species depends on their concentrations, on the amount of water discharged per hour, on the water flow in the receiving water body, etc. Although the discharged concentration levels may be low, the total amount of nitrogen discharged into the environment may be considerable, in particular for net enclosures and flow-through systems where no within-farm assimilation or sedimentation occurs, as only 35–40% of feed N is retained in the fish body.

	Net enclosures	**Ponds**	**RASs (incl. hatcheries)**	**Flow-through systems**
Risk of env. impact	Moderate	Moderate to significant	Significant	Significant
Typical values NH_4-N NO_2-N NO_3-N	Total DIN: 0.01–0.1ppm	0.2–10ppm 0.01–1.5ppm 0.05–5ppm	<1ppm <1ppm 60–140 ppm	1–2ppm <0.5ppm 1–5ppm
Frequency	Weekly	Weekly	At least weekly	Weekly
Where to sample	Inside the pen	Different locations in the pond; water column sample	In the sink (after nitrification reactor)	Before the outlet

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PO_4^{3-}-P

In aquatic systems, phosphorus (P) appears in different forms. It can be present as any of the dissolution ions of H_3PO_4 (dissolved inorganic phosphorus (DIP)), bound to organic compounds (dissolved organic phosphorus (DOP)), present in particulate matter (particulate phosphorus (PP)) or bound to sediments. Reactive phosphate gives the amount of dissolved orthophosphate ions (PO_4^{3-}) measured in the filtrate of a water sample, poured over a 0.45µm filter. P measured in the substrate remaining on the same filter gives an estimation of the PP. Total phosphorus is analyzed after acid digestion of an unfiltered water sample by measuring the total amount of inorganic, organic, and particle-bound phosphorus (e.g., P incorporated in bacteria and plankton organisms). Reactive P is a direct measure of the eutrophication potential as the orthophosphate ions are easily taken up by algae. The majority of P in aquaculture originates from feeds (or fertilizers, where applied). As aquafeeds increasingly use plant ingredients, most of the P in these ingredients is phytate-bound and unavailable to the fish and is therefore excreted via the feces (solid waste). Studies show that at least 45–70% of the feed-P ends up in the environment. Fecal (and feed remnant) P adds to the PP complex. Depending on their physical characteristics, particles remain floating as suspended solids or settle to the bottom (in oceans, lakes, or ponds). The sediments in oceans, lakes, and ponds constitute a major sink for P, as the latter is usually immobilized in soil-based iron complexes which are insoluble in aerobic conditions and/or acid soil pH. However, these conditions may fluctuate seasonally and sediments are therefore also a source of P in the water column during reflux periods, contributing to the risk of eutrophication. In RASs and flow-through systems with a solids separator, the collected sludge may be rich in P and organic N, and, after water extraction, can be used as a fertilizer in agriculture. In RASs with a denitrification unit, however, this sludge-bound P may be released into the sump as orthophosphate ions, enriching the effluent water. Mitigation measures are not easy in cases of orthophosphate discharge. Phosphorus removal from effluents is technically possible but extremely expensive; solid-bound P can be handled via the solid waste management procedures (e.g., being used as fertilizer, see above). The impact of orthophosphate discharge into the environment ultimately depends on the size of the recipient water body, the possible dilution effect from water currents, etc.

	Net enclosures	**Ponds**	**RASs (incl. hatcheries)**	**Flow-through systems**
Risk of env. impact	Significant	Moderate	Significant	Significant
Typical values	0.005–0.1ppm PO_4^{3-}-P in the culture water	0.005–5ppm in the culture water	15–50ppm	0.10–0.15ppm
Frequency	Weekly	Bi-weekly	Monthly	Weekly
Where to sample	Inside the pen	Near the outlet; water column sample	In the sump tank	Near the outlet

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Suspended solids

Suspended solids are solid particles that float in the water. Particle size can vary from less than 1µ to >100µ (microns). Particles smaller than 2µ are considered dissolved solids. Total suspended solids are measured by filtering a known volume of water over a 2µ fiberglass filter and weighing the dry substrate on this filter. Larger particles can be removed via sedimentation or by screens. Drum filters, which are commonly used in RASs, usually have screens of 60–200µm. The very small particles (<30µ) can be removed via foam fractionation. Suspended solids originate from feed remnants, feces, inorganic particles, microbial flocks, and the amount of suspended solids that enter the system via input water. The latter may be significant if, e.g., eutrophic river water is used to fill or renew ponds. To determine their environmental impact, it is important to quantify the ratio of organic vs inorganic particles in the suspended solids. Remediation can involve the use of settling tanks, screens (e.g., drum filters), or hydrocyclones (swirl separators), etc., before discharging the effluent into the open environment. These measures may reduce the suspended solid load by 60% or more.

	Net enclosures	**Ponds**	**RASs (incl. hatcheries)**	**Flow-through systems**
Risk of env. impact	Low (within 100m)	Moderate to significant	Moderate	Moderate to significant
Typical values	3–10mg/l	25–150mg/l	5–50mg/l	5–75mg/l
Frequency	Monthly	Monthly	Monthly	Bi-weekly
Where to sample	Underneath the pen	Near the outlet	In the effluent tube/in the sump tank	Near the outlet

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Chemicals

Producing aquatic foods requires the incidental use of chemotherapeuticals (antibiotics, etc.) to combat diseases or parasites. The level of use differs strongly between production sectors and geographical areas. For example, the use of antibiotics has been reduced to nearly zero in Norwegian salmon culture but is still widespread in Chilean salmon farming. Further, chemicals are often used as antifouling agents in net pen cultures. Heavy metals may leach from equipment suspended in water. Disinfecting agents may be used to disinfect pond soils between production cycles and/or to disinfect equipment.

The risk to the environment is not necessarily high, and usually local. However, record keeping and close monitoring are warranted.

	Net enclosures	**Ponds**	**RASs (incl. hatcheries)**	**Flow-through systems**
Risk of env. impact	Low	Low	Low	Low

Glossary

BOD: Biochemical (or biological) oxygen demand

The BOD refers to the amount of dissolved oxygen consumed by a water sample (mostly due to the respiration of microorganisms and decomposition of organic compounds in the water, but also due to respiration of other organisms in the water such as zooplankton and phytoplankton) over a given period of time. Typically, this is a period of 5 days, hence the notion of BOD_5, but this period may change depending upon the amount of organic matter in the sample. To enable a proper estimation, there must be dissolved oxygen left at the end of the measuring period. As the amount of dissolved oxygen in water is limited (saturation concentration), the water sample may be diluted if the water has a high organic load.

COD: Chemical oxygen demand

The COD refers to the amount of dissolved oxygen needed to completely oxidize all organic compounds in the water. It is measured by adding potassium dichromate to an acidified water sample at boiling temperature. Typically, the procedure lasts two hours and is therefore a quicker method than analyzing BOD. As COD also includes the chemical oxidation of compounds, it is always higher than the BOD levels in the same water.

The ration between BOD and COD can be used as an indicator for the biodegradability of the organic matter in the water and is frequently used in wastewater treatment. For aquaculture plants, the higher the biodegradability of the organic matter in the effluent, the more easily it can be treated (reduced) before emitting it to the environment.

CO_2: Carbon dioxide

CO_2 is a known greenhouse gas that also dissolves in water. In water, CO_2 reacts with water to form carbonic acid (H_2CO_3) which dissociates immediately into its ionic forms HCO_3^- (bicarbonate) and CO_3^{2-} (carbonate). The molecular form under which CO_2 is prevalent in a particular body of water is highly dependent on the water pH.

Its concentration in the water seeks an equilibrium with the CO_2 in the air above the water surface. If the CO_2 in the water is above the equilibrium level, the gas will be stripped to the air. A main source of CO_2 in the water is the respiration of organisms, while algae and submerged plants may absorb it from the water during photosynthesis.

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H_2S: Hydrogen sulfide

Also known as “sewer gas,” hydrogen sulfide produces a strong odor of rotten eggs, even at low concentrations. It is produced by bacteria that decompose organic matter containing sulfur. It occurs mainly in anaerobic conditions.

NH_4-N: Ammonia-nitrogen (to be distinguished from NH_4: ammonia)

The amount (moles) of nitrogen present in a particular mass of ammonium ions (often colloquially referred to as ammonia) in water. As the molar weight of the different nitrogen species in the water differs according to the ion type, referring to the molar concentration of the nitrogen atom is usually preferred to enable comparison between the different forms in which nitrogen is present.

The NH_4^+ concentration in the water is the result of ammonia (NH_3) excretion by animals on one hand and, where relevant, the uptake by algae and plants on the other hand; the extremely toxic free ammonia (NH_3) reacts with water to form the less toxic ammonium ion (NH_4^+). However, as the dissociation equilibrium of NH_3/NH_4^+ is highly dependent on pH, even relatively small amounts of NH_4^+ in water may convert into toxic NH_3 at pH levels above 7.5 to 8.

NO_2-N: Nitrite-nitrogen

The amount (moles) of nitrogen present in a particular mass of nitrite ions (NO_2^-). Nitrite is predominantly formed by bacterial conversion from ammonia in the first step of the nitrification reaction. Nitrite is highly toxic to most aquatic organisms. A bioreactor in an RAS is specifically designed to convert the toxic ammonia into the less toxic nitrate; this is a two-step reaction driven by different bacterial species; if the two reaction steps are not well balanced, nitrite may (temporarily) accumulate in the water.

NO_3-N: Nitrate-nitrogen

The amount (moles) of nitrogen present in a particular mass of nitrate ions (NO_3^-). Nitrate is predominantly produced in the final step of the nitrification of ammonia; the NO_3-N levels in the water are the result of nitrate production and its absorption by the plants/algae in the water.

DIN: Dissolved inorganic nitrogen

The total amount of dissolved inorganic nitrogen, i.e., the combined amount of NH_4-N, NO_2-N, and NO_3-N dissolved in the water.

PO_4^{3-}-P: Orthophosphate phosphorus; to be distinguished from orthophosphate

The amount (moles) of phosphorus (P) present in a particular mass of orthophosphate ions (PO_4^{3-}). Orthophosphate is one of the ions into which phosphoric acid can dissociate and the form which can be absorbed by aquatic plants/algae. For the latter reason, it is also called reactive phosphorus or soluble reactive phosphorus.

H_3PO_4: Phosphoric acid

Phosphoric acid dissociates in water:

$H_3PO_4 \leftrightarrow H_2PO_4^- \leftrightarrow HPO_4^{2-} \leftrightarrow PO_4^{3-}$. Being a weak acid, phosphoric acid does not dissociate completely, and per unit mass phosphoric acid, only a tiny amount ends up as orthophosphate ions (PO_4^{3-}). Most of the dissolved phosphorus in water will be present as H_2PO^{4-}. However, it is the orthophosphate ion that is biologically active.

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DIP: Dissolved inorganic phosphorus

Although DIP is usually measured as soluble reactive phosphorus (i.e., PO_4^{3-}), it often exists as the sum of all dissociation ions of phosphoric acid. De La Rocha and Passow (Treatise on Geochemistry, 2014) mention that at common seawater pH (8), 87% of DIP consists of HPO_4^{2-} and only 12% of PO_4^{3-}.

PP: Particulate phosphorus (or particle-bound phosphorus)

Phosphorus attached to the particulate matter that remains on the filter.

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4 GUIDELINE AQ IV – THE RAMSAR CONVENTION ON WETLANDS

Contracting parties in order of their accession

The "Convention on Wetlands of International Importance," called the "Ramsar convention," is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. The convention was adopted in the Iranian city of Ramsar in 1971 and came into force in 1975. Since then, almost 90% of UN member states from all the world's geographic regions have acceded to become contracting parties.
The convention's mission is "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world." Wetlands are among the most diverse and productive ecosystems. They provide essential services and supply all our fresh water. However, they continue to be degraded and converted to other uses.
The convention uses a broad definition of wetlands. It includes all lakes and rivers, underground aquifers, swamps and marshes, wet grasslands, peatlands, oases, estuaries, deltas and tidal flats, mangroves and other coastal areas, coral reefs, and all human-made sites such as fishponds, rice paddies, reservoirs, and salt pans.

Key information on each Ramsar contracting party can be found here.

A list of the contracting parties and the date on which the convention entered into force for each party can be found here.

(Source: Ramsar official website, www.ramsar.org)

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5 CONTINUOUS IMPROVEMENT PLAN

5.1 Documentation of a continuous improvement plan

Principle	A continuous improvement plan is documented.
Criteria	The producer shall evaluate the farming operation and identify improvements to be undertaken as assessed by the standard. These improvements shall be included in a longer-term plan covering up to three years. The continuous improvement plan shall consist of relevant self-defined targets and describe how progress toward each target will be monitored. The plan may include: • Description of improvement objective • Current status, with date of initial target establishment • Planned activity • Target outcome with estimated date of achievement
Level	**Major Must**
Evidence (justification method)	Visual – oral – **written** • There is a document, either on paper or electronic. • The document content is described in “Guideline” below. • A field visit and dialogue with the producer provide evidence of implementation.
Audit method	**On-farm – off-site – remote** Preferably on-farm, as the implementation shall be verified. The inspection of the plan can take place off-site if implementation of the plan is later verified on the farm.
Guideline	No process is perfect; there is always room for improvement. You as a producer are aware of the need to constantly have an eye on your products to achieve the best result. This also applies to the idea of the continuous improvement plan. Continuous improvement means systematically identifying and mitigating waste of resources as quickly as possible and at the lowest possible cost, thus increasing efficiency. **In short: continuous improvement is the consequent increase of productivity in small steps.** The process of continuous improvement includes monitoring and analyzing data. Only with relevant data can self-defined targets be planned, implemented, and verified.

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	Such a target does not necessarily have to be a numerical value. A yes/no statement, for example on whether a particular goal has been reached, is also possible. Within the context of the standard, the initial approach to continuous improvement is: **Establishing a continuous improvement plan: Major Must** **Implementing the continuous improvement plan: Minor Must** The continuous improvement plan identifies relevant self-defined targets and describes how progress toward each target will be monitored. The plan may include: • Topic • Current status with date of initial establishment of target • Planned activity • Planned outcome with estimated date of achievement Once the targets documented in the continuous improvement plan have been reached, new targets are established by the producer.

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5.2 Implementation of a continuous improvement plan

Principle	There is evidence that a continuous improvement plan is implemented.
Criteria	The implementation of identified points in the continuous improvement plan shall be supported by evidence. Evidence may include new procedures or policies, data sharing (to quantify changes), training, etc. The continuous improvement plan shall be supported by documented evidence. The evidence kept on file may include: • Actual outcome of efforts, with date of evaluation • Comments on why the effort was successful or not successful • If one or more of the goals are not reached, justification and description of further action • Sharing of relevant data with the GLOBALG.A.P. Secretariat
Level	**Major Must**
Evidence (justification method)	**Visual – oral** – written A field visit and dialogue with the producer provide evidence of implementation of the documented plan.
Audit method	**On-farm** – off-site – remote The implementation shall be seen on-farm. Where evidence of implementation is not yet available at the time of the certification body (CB) audit, justification and description of further action shall be documented.
Guideline	**Implementation:** It is up to you to choose the topics and activities for continuous improvement of your operation. Once a topic and activity are identified, you shall document this in your continuous improvement plan. The continuous improvement plan shall be established for the first self-assessment and CB audit to IFA v6. The plan may cover a period of time, normally a period of three to four years, but is linked to the planned activities (can also be within one year). Within this set time, milestones (defined targets) can be defined to be able to verify whether the activities are having the intended effect. For the first self-assessment, internal audit, and CB audit the continuous improvement plan will be established. During the second self-assessment and CB audit to IFA v6, the initial results of the continuous improvement plan shall be presented and discussed.

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	The implementation of the continuous improvement plan is supported by documents and/or other objective evidence. The evidence kept on file may include:
	• Actual outcome of efforts, with date of evaluation
	• Comments on why the effort was successful or not successful
	Once the topics in the continuous improvement plan are implemented, new topic(s) shall be identified and a new continuous improvement plan shall be established.
	If one or more of the goals identified in the continuous improvement plan are not reached, justification and description of further action shall be documented.
	Implementation in Option 1 (individual certification)
	An individual producer is allowed to implement one or more verifiable topics. These may differ per product, region, or any other factor.
	Implementation in Option 2 (group certification)
	For a producer group there are different ways of implementing the continuous improvement plan. What is important is that all producer group members be involved.
	• **Implementation of one or more topics at producer group level**
	  ○ Not all producer group members may be doing the same activity.
	  ○ Activities may differ per product, region, or any other factor.
	• **Implementation of one or more topics at producer group member level**
	  ○ All producer group members are involved.
	  ○ Activities may differ per product, region, or any other factor.
	• **Implementation of one or more topics at producer group and producer group member levels**
	  ○ All producer group members are involved either at producer group or producer group member level.
	Plan – Do – Check – Act cycle
	Careful management of this process is essential. To make sure that the integration of data and reporting in the production process's day-to-day operations is working, having a good plan and the right tools is essential.
	The Plan – Do – Check – Act (PDCA) cycle is a good tool for continuous improvement.

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	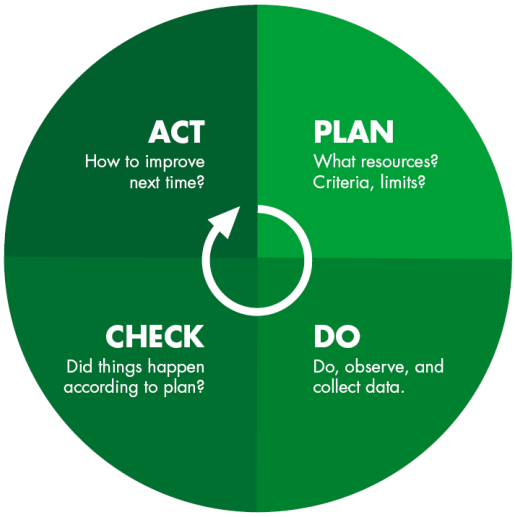 **The four steps of the PDCA cycle are:** Plan Identify of an opportunity for continuous improvement in the production process. Plan how to implement the change. Write down the expected results once you have determined your course of action. Do Implement the change on a small scale. Check Analyze data on the results of the change and determine whether it made a difference. Act If the change was successful, implement it on a wider scale and continuously assess the results. If this change did not work, identify another opportunity for continuous improvement and start the cycle again.
Examples	Continuous improvement can mean: ***Responding, reducing, maintaining, achieving, completing, ensuring, enhancing, improving, etc.*** For example: • Responding to complaints within a specified time frame • Reducing the number of complaints/non-conforming products • Improving a training program/traceability system In the different sections of IFA v6 there is reference to topics that may be identified for the continuous improvement plan, for example the consumption of: • Water • Energy

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	• Fertilizer • Plant protection products For these or other topics targets can be defined, for example based on volumes. However, any other topic can be chosen. The list below is not exhaustive and only offers ideas. Other topics covered in the standard or related to the production process can also be used for the continuous improvement plan. **Food safety** • Testing of products and utilities (e.g., testing for chemical residues, microbial water quality) • Non-conforming products • Postharvest washing process **Workers' well-being** • Support of professional development (training) • Social benefits • Childcare • Improvement of social surroundings • Incentives for good and safe working performance **Biodiversity** • Buffer strips along watercourses • Planting trees • Retention of landscape features (walls, hedges, ponds, watercourses, or trees) • Building new structures (stones, wood) next to farm or production areas • Conservation of wild birds (birdhouses for birds and bats) • Stopping invasive alien species **Other** • Outcome of self-assessment • Complaint management

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6 METRICS

6.1 Guideline purpose

This guideline addresses the metrics for the product category aquaculture for both of the following:

- Integrated Farm Assurance (IFA) standard version 6
- Impact-Driven Approach to Sustainability (IDA) add-on in its current version

The purpose of this guideline is to provide producers and auditors with information to support the interpretation as well as the interpretation of the principles and criteria (P&Cs) associated with the use of metrics. The guideline gives more detailed specifications on what type of metrics producers are expected to record in order to meet the requirements of the P&Cs.

The same guideline is used for the IDA add-on. Those parts of the guideline which apply to the IDA add-on only are indicated.

6.1.1 Glossary for this guideline

Definition: Definition of the metric and a short description of what shall be recorded for the metric

Frequency to record: Indicates how often and when the producer shall record the events related to the metric. Certification body (CB) auditors shall check that the recording of the data meets the frequency requirement. CB auditors shall also check that the producer has a system in place where the information is consistently recorded and that the recording of the metrics is centralized to this system.

Frequency to report to the GLOBALG.A.P. Secretariat: *Applicable to the IDA add-on.* To comply with the IDA add-on, the producer shall transfer the metric-related data to the GLOBALG.A.P. Secretariat on regular basis via a GLOBALG.A.P. approved farm management system (FMS). The FMS can also automatically transfer the information as soon as it has been recorded, but this section defines the minimum frequency of transferring the metric-related data to the GLOBALG.A.P. Secretariat.

The producer shall make sure to use the FMS as instructed by the FMS provider so that information can be transferred to the GLOBALG.A.P. Secretariat. The producer shall also make sure that the FMS has the necessary permissions to transfer information to the GLOBALG.A.P. Secretariat. The FMS shall be set up so as to ensure that the technical connection to the GLOBALG.A.P. Secretariat is working and that any potentially necessary unit conversions are done before transferring the information to the GLOBALG.A.P. Secretariat.

Impact-Driven Approach (IDA): IDA is a GLOBALG.A.P. add-on applicable to flowers and ornamentals, fruit and vegetables, and aquaculture. The IDA add-on uses data and metrics to encourage and measure continuous improvement at farm level. Certain sections of this metrics guideline address requirements that are relevant only to those producers aiming to comply with the IDA add-on. These sections are marked with an asterisk (*) and do not concern IFA-related metrics or their evaluation.

Information related to the Impact-Driven Approach (IDA): For the purposes of the IDA add-on, the GLOBALG.A.P. Secretariat will require that the data be transferred to the GLOBALG.A.P. Secretariat in a particular format so that proper data analysis and aggregation can be performed. For this purpose, the producer shall use an approved FMS that can convert the units and data used by the producer so that they will be compatible with GLOBALG.A.P. requirements. The CB auditor shall check that the producer is using one of the approved FMSs.

Approved FMSs can be found here.

Latest technical documentation on data formats and system requirements for FMSs can be found here.

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Indicator: A type of data that indirectly measures the (sustainability) issue in question

Information to be recorded: Indicates what level of information recording is expected in order to meet the P&Cs. The producer shall have records of the expected data points to meet the metric criteria. The producer can record the data points in the units most appliable to the producer's circumstances, as long as the recording of the information is consistent and done with the necessary frequency.

Metric: A system or standard of measurement

Peer group: *Applicable to the IDA add-on.* For the purposes of the IDA add-on, the GLOBALG.A.P. IT systems will compile similar producers into peer groups to provide comparable data on the peer group's average inputs (see "Type of output") compared to the producer's own inputs. The peer group is based on the producer's location, aquatic species produced, and production circumstances as recorded by the producer according to GLOBALG.A.P. requirements. Members in the peer group are anonymized and an individual producer cannot see the data of other individual producers, only aggregated average values of the peer group.

Purpose: Briefly describes the rationale ("the why") for using the metric.

Type of output: *Applicable to the IDA add-on*. With participation in the IDA add-on, the producer will receive benchmark reports sent to their FMS. The benchmark reports will contain the producer's aggregated historical data regarding the input consumption of the metric. Furthermore, the benchmark report will contain an anonymized comparison to other relevant producers in the IDA system and the intensity of the input consumption of the producer compared to peer producers for the given metric.

6.1.2 Prerequisites for metric recording

Site

To record metrics, the producer shall have a clear understanding and records of relevant sites and their boundaries. The producer shall be aware of the site's total area, as well.

*For IDA add-on purposes, the producer shall also record the location of the site with geospatial coordinate information. Refer to the IFA standard for aquaculture, AQ 2.4 "Geographical coordinates identify all operations of the farm."

*Note: Only with the above-mentioned data points shall the producer be able record the metric data for the IDA add-on.

Batch

Some metrics require the producer to register the input consumption associated with the metric of a batch (or group of batches in a certain period) produced on the site. Each batch shall have one type of a species. The producer shall be aware of and record the batches produced on each site, the dates when the batches are produced, and the expected and harvested biomass of the batch on site. With this information, the producer can relate the input consumption metrics to the size of production (e.g., compound feed, treatments) and use production size as a basis for related metrics (mortalities, escapes, energy use).

*For IDA add-on purposes, the producer shall also record the production type and other production circumstances as specified here. This information allows generating the outputs that compare the producer to the relevant peer group producing under similar circumstances.

*The producer shall also indicate the company type, aquaculture grow-out system used for a batch or group of batches, and whether the producer is a member of a producer group. Grow-out systems are grouped into four main categories: Pond, net enclosure, flow through, RAS.

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*Note: Only with the above-mentioned data points shall the producer be able to record the metric data for the IDA add-on. Note also that some outputs of the IDA system cannot be generated until the producer has indicated the biomass at harvest. Biomass at harvest refers to the metric tons of live weight at point of harvest (step before any postharvest activity).

6.1.3 Compliance with Impact-Driven Approach for aquaculture – elements for auditing

The producer shall have three months of consecutive data-registering history before a first CB audit may take place.

Once the CB audit can take place, three conditions are required for a producer to demonstrate compliance with IDA for aquaculture (as described in the IDA aquaculture rules, section "Audit process").

The CB audit includes checking the following three aspects:

a) **Reliability of digitally registered data** against farm conditions, including records kept at farm level and ways in which data is collected and recorded

b) **Compliance with the P&Cs** of the IDA add-on

c) **Confirmation** that the **producer digitally registered the data through the FMS for the GLOBALG.A.P. Secretariat on a monthly basis**, as required in the P&Cs

Reliability of digitally registered data refers to the confirmation that registered and digitally shared data correspond to real use/applications and to real farm conditions. The CB audit is not meant to verify all data. A sample or several samples of data may be verified in different ways. Examples of verification may include the following:

- Confirming that the sites and batches are active at the time of the use/application
- Identifying how data was obtained: whether through estimations or using measuring devices
- Confirming whether the mentioned devices are on site and functional
- Cross-checking data with invoices or records of feeding and antimicrobial/vaccine treatments

Compliance with the P&Cs of the IDA add-on refers to the CB audit of the P&Cs as specified in the corresponding P&Cs in the add-on.

Confirmation that the producer digitally registered the data through the FMS for the GLOBALG.A.P. Secretariat on a monthly basis is a critical element in IDA for aquaculture, since the producer is required to share data at regular intervals.

Prior to the audit, the CB shall confirm that the producer has been sharing data as required in the add-on, i.e., with respect to periodicity and data points.

- If the applicant producer is already certified against a scheme that claims to digitally collect the same data points, the CB may perform the audit without confirmation that the producer has shared data for the minimum period required. At the producer's risk, the CB can confirm this during the audit.
- If the producer applying for the CB audit has already registered data through a different FMS, the audit can take place as long as the data has been shared with the GLOBALG.A.P. Secretariat and meets the required periodicity and data points.

If a producer has been granted a letter of conformance, failing to report continuously may lead to sanctions. It is important for the CB to monitor every month whether the producer meets this requirement.

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6.2 Quantitative mortality indicator

Metric	Mortalities in the grow-out stage in aquaculture
Definition	The rate of mortalities occurring for a given species in each batch during the grow-out stage in aquacultural production
Purpose	Determining animal welfare and production conditions
Information to be recorded	To record the mortality-related metrics, the producer shall record/report each mortality event with the following data: • Registration date of the mortalities • Reporting on the number of mortalities either in biomass or number of deceased individuals ○ If the producer reports the number of deceased individuals, the producer shall indicate the average biomass of a deceased individual • Cause of mortality • Reporting that the producer is aware in which batch the mortalities have occurred
IDA-related information*	The data shall be recorded with a GLOBALG.A.P. approved FMS that will ensure that the data is transferred to the GLOBALG.A.P. Secretariat. The FMS shall enable the correct conversion of units so that the GLOBALG.A.P. Secretariat can receive the data. GLOBALG.A.P. provides a list of mortality causes that shall be used.
Frequency to record	After the mortality event has occurred or been discovered
Frequency to report to the GLOBALG.A.P. Secretariat*	Monthly – at the end of a calendar month, the GLOBALG.A.P. Secretariat shall receive the mortality information. If there are zero mortalities, this shall be recorded and reported as well.
Type of output*	An individual historical report, a report with data of a single producer showing trends in mortalities over time: • Mortality ratio compared to expected biomass at harvest • Mortality ratio compared to real final biomass at harvest A benchmarking or comparison report between peer producers, comparing mortality rates and intensity of mortalities to relevant peer producers in percentage based on tonnage expected and real tonnage at point of harvest, i.e., final biomass. Within a peer group, the indicator provides a notion of the range of distribution of mortalities in the same species under similar circumstances. Peer producers are anonymized.

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6.2.1 Mortality-related P&Cs in IFA for aquaculture

Section	Principle	Criteria	Level
AQ 20.02.01	An aquaculture health plan (AHP) is available, updated during the last 12 months, for the last production cycle, or whenever new medicines or treatments not previously used have been added.	An AHP shall be available on the site. A certified veterinarian/aquatic animal health professional recognized by a competent authority shall approve the AHP. Name, affiliation, and dated signature shall be included in the AHP. A certified veterinarian/aquatic animal health professional is the professional responsible for health management on the farm who has the legal authority to diagnose disease and prescribe medication. This definition applies to all references to a veterinarian throughout the standard documents. The AHP shall be updated either: a) Annually b) b) For each production cycle, if farmed aquatic species are at the farm for a period shorter than one year c) Whenever any of the content of the AHP requires updating (e.g., inclusion of new medicines or treatments) The plan shall include but is not restricted to the following: […] 14. **Frequency and methods of mortality inspection** […] 16. **Recording of mortality and its causes**, which shall be done daily or as often as possible. Where a disease outbreak is suspected or mortalities are higher than expected, the veterinarian/aquatic animal health professional and relevant government official shall be notified. […]	Major Must
AQ 20.02.07	Documented instructions to notify the relevant competent authority of disease problems, where stipulated by law or by the World Organization for Animal Health (OIE), are in place.	Producers shall demonstrate knowledge of which notifiable diseases or types of **mortality events** shall be **reported to the statutory authority or OIE**. At a minimum, any diseases stipulated as notifiable by the OIE shall be disclosed (www.oie.int). No “N/A.”	Major Must

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Section	Principle	Criteria	Level
AQ 20.02.08	The hatchery/farm has in place a system to monitor and register farmed aquatic species health and welfare indicators and all disease occurrences.	A system to monitor and register farmed aquatic species health and welfare indicators and all disease occurrences at hatcheries/farm sites shall be in place. The register shall contain at least: • Observations • Diagnosis • Treatment • **Mortalities** […]	Major Must
AQ 20.02.09	The producer demonstrates both understanding of hygiene practices regarding farmed aquatic species health and welfare, and implemented hygiene procedures which are suitable to the farm.	A documented hygiene plan shall detail the most important elements regarding farmed aquatic species health and welfare: • Water quality • Cleaning methods • Cleaning agents (labeled for food contact surfaces, where appropriate) • Disinfectants • Application period • Application frequency • Collection and handling of **mortalities** The plan shall be implemented and recorded. Workers shall be able to demonstrate awareness at interview. Cross-reference with AQ 03.03. No "N/A."	Major Must
AQ 20.05.01	**Mortality inspection and removal from the production units** are carried out according to the aquaculture health plan (AHP).	**Mortality records shall be available for the certification body (CB) audit.** Moribund farmed aquatic species shall be removed as they appear. No "N/A."	
AQ 20.05.02	**Mortalities, cause of death, and mortalities trend analysis are recorded at production unit level.**	**Records of mortalities and cause of death**, when known, shall be in place per production unit. **The frequency of mortalities recording shall be defined** and be performed as often as possible.	Major Must

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Section	Principle	Criteria	Level
		Records shall also include percentage per production stage. Workers shall show awareness of farmed aquatic species health status/mortality causes at interview. Actions shall be taken when trends are identified. The self-assessment/internal audit and certification body (CB) audit reports shall have a value of the overall **percentage of mortalities per production stage** and values linked to the causes of death.	
AQ 20.05.04	The farm has a contingency plan for dealing with mass mortalities.	The farm shall have a **contingency plan for dealing with mass mortalities.** Workers shall be able to demonstrate awareness at interview. No "N/A."	Major Must

Holding facilities prior to slaughter – refers to when farmed aquatic species are transported live to the slaughter/processing station:

Section	Principle	Criteria	Level
AQ 25.02.01	The organization has a plan to monitor and **record trend analysis in mortality**.	Site plans to **monitor mortality and records of mortality trend analysis** shall be assessed.	Minor Must
AQ 25.02.02	For the legal disposal of large-scale mortalities, a contingency/action plan is in place in case of a severe disease episode or mass mortality.	The contingency/action plan shall be verified and shall comply with legal requirements where these exist. Workers shall be able to demonstrate awareness at interview.	Major Must
AQ 25.02.03	**Mortalities are recorded and removed from the holding areas and reasons for death are recorded, where known.**	Records of **cause of death** shall be verified.	Minor Must

Note: The mortality metric which shall be evaluated in the IDA add-on also forms part of the CB audit report of the legal entity. Refer to AQ 20.05.02.

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6.3 Quantitative feed conversion ratio and fish meal indicator

Metric	Economic feed conversion ratio (eFCR) and fish meal percentage in the feed used at the grow-out stage in aquaculture
Definition	The eFCR describes the quantity of feed used to produce a quantity of fish. The fish meal percentage describes the proportion of fish meal in the feed along with the origin of the fish meal used in feed during the grow-out stage.
Purpose	• Determining the efficiency of feeding (eFCR) • Determining the percentage of fish meal used and where possible its origin (wild catch, industrial by-products, other)
Information to be recorded	To record the eFCR and the amount of wild foraged catch, the producer shall record and be aware of the following: • Date when the feeding has taken place • Amount of compound feed used per batch • Percentage of fish meal and fish oil in the compound feed used on same batch • Share of wild foraged catch in the fish meal • Reporting that the producer is aware to which batch the compound feed was given The producer shall be able to calculate the eFCR based on the biomass at harvest for a given batch and the amount of feed given to the batch. eFCR = Feed (in kg or mt)/Net aquaculture production (in kg or mt live weight) Net aquaculture production = [Final biomass] – [Initial biomass] Initial biomass = [number of fish in a farm batch] × [individual weight]
IDA-related information*	The data shall be recorded with a GLOBALG.A.P. compatible FMS that will ensure that the data is transferred to the GLOBALG.A.P. Secretariat. The FMS shall enable the correct conversion of units so that the GLOBALG.A.P. Secretariat can receive the data.
Frequency to record	After each feeding event. Each event shall be recorded separately. Note that in the case of IFA, the eFCR can be calculated on a yearly basis by the producer. For IDA, the GLOBALG.A.P. IT systems can return the eFCR on a monthly level (see “Type of output”) that the producer’s system can further aggregate into a yearly average, for instance.
Frequency to report to the GLOBALG.A.P. Secretariat*	Monthly – at the end of a calendar month, the GLOBALG.A.P. Secretariat shall receive eFCR and fish meal/oil percentage information.

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Type of output*	An individual historical report, a report with data of a single producer showing trends in use over time: • Returned eFCR based on feed given to a species and harvested biomass of the species • Percentage of fish meal in the feed for a given species • Percentage of wild catch, industrial by-products in the feed for a given species A benchmarking or comparison report between peer producers, comparing average eFCRs of peer producers. Comparison also between the share of fish meal and amount of wild catch in the fish meal to peer producers. Within a peer group, the indicator provides a notion of the range of distribution of eFCR and fish meal use under similar circumstances. Peer producers are anonymized.

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6.3.1 Fish meal- and eFCR-related P&Cs in IFA for aquaculture

Section	Principle	Criteria	Level
AQ 22.02.05	Records of **feed conversion ratios (FCRs)** and efficient use of feed monitoring systems are in place.	Records of FCRs and efficient use of feed monitoring systems shall be in place. Overfeeding shall be avoided at all times. The economic feed conversion ratio eFCR is the quantity of feed used to produce the quantity of fish harvested (net production is the live weight): **eFCR = Feed (in kg or mt) / Net aquaculture production (in kg or mt; live weight)** The self-assessment/internal audit and certification body (CB) audit reports shall have at least one FCR value recorded: eFCR per production life cycle.	Major Must
AQ 22.02.03	Farms obtain from their feed suppliers a declaration that the composition of each feed conforms to the GLOBALG.A.P. requirements on fishmeal and fish oil.	Statements specifying conformance shall be in place. The compound feed supplier shall provide information on the fishmeal and fish oil composition upon request, including fish meal and fish oil percentage and, where possible, origin (wild catch, industrial by-products, other). Farms shall have in place a fish-in/fish-out ratio (whole fish from wild catch). The self-assessment/internal audit and certification body (CB) audit reports shall have at least two values recorded: Average fish meal and fish oil percentage (where possible, both described for each origin) *and* the fish-in/fish-out ratio.	Major Must

Note: the eFCR and fish meal metrics which shall be evaluated in the IDA add-on also form part of the CB audit report of the legal entity. Refer to AQ 22.02.05 and 22.02.03.

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6.3.2 Fish meal-related P&Cs in the GLOBALG.A.P. Compound Feed Manufacturing standard

These P&Cs shall be complied with by feed suppliers supplying compound feed to aquaculture farms with IFA certified production processes:

Section	Principle	Criteria	Level
A 5.3	**Responsible sourcing of marine feed ingredients** *The policy and objective for sourcing marine ingredients is that documentation shall provide information that fishmeal and fish oil do not originate from illegal, unreported, and unregulated (IUU) fishing as defined by the FAO International Plan of Action to prevent, deter, and eliminate IUU fishing.* ***Fishmeal and fish oil derived from IUU fishing is prohibited for inclusion in compound feed manufactured according to this standard.***		
A 5.3.1	**All marine ingredients**		
A 5.3.1.1	Can the origin of species of wild-captured fish used to produce fishmeal and fish oil be traced with regard to: • The species of origin and • The country of origin? Is the compound feed manufacturer able to demonstrate that the list of fish species used to produce fishmeal and fish oil does not contain species classified as critically endangered or endangered in the IUCN Red List at the time of purchase?	The compound feed manufacturer shall verify that the species used to produce fishmeal and fish oil do not originate from wild capture fisheries of species that are classified as critically endangered or endangered in the IUCN Red List (IUCN – The International Union for the Conservation of Nature and Natural Resources). This criterion requires that the supplier provide the information on the species used at the time of purchase. This information shall also include where the fishmeal and fish oil were produced (country of production). If species are not evaluated, they will not be recorded in the Red List, and this is acceptable if no other sources of information conclude that these are endangered species. N/A if fishmeal or fish oil is not used.	Major Must

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Section	Principle	Criteria	Level
A 5.3.2	**Marine ingredients from reduction fisheries**		
A 5.3.2.1	Are the fisheries used to produce fishmeal and fish oil regulated and in compliance with the laws and regulations of the country of production, and are the ingredients of the fish meal/oil free of any IUU fish as defined by the related FAO International Plan of Action?	The fisheries that are used to produce fishmeal and fish oil shall be regulated and in compliance with the laws and regulations of the country of production. The fishmeal and/or fish oil producer shall present the compound feed manufacturer with documentation that the catch processed does not originate from any IUU fisheries as defined by the related FAO International Plan of Action.	Major Must
A 5.3.2.2	Is there a documented and verified traceability system in place that is provided by the manufacturer of marine ingredients as derived from reduction fisheries and to be delivered to the manufacturer of compound feed?	There shall be written information in place on the traceability system of marine ingredients that are derived from targeted reduction fisheries. This traceability system shall be based at minimum on second-party verification, but preferably on third-party verification. The manufacturers of the said marine ingredients shall provide this information to the manufacturer of compound feed, where it shall be available at the time of audit.	Minor Must
A 5.3.2.3	Does a minimum of 60% of the annual purchases of marine ingredients originate from responsibly managed fisheries?	A minimum of 60% of the annual purchases of marine ingredients used to produce compound feed shall originate from responsibly managed fisheries. This may be verified via schemes recognized by the Global Seafood Sustainability Initiative (scope fisheries) or accepted under the MarinTrust program. Fishery Improvement Projects as listed on the Fishery Progress website shall have active status, the types “basic” or “comprehensive,” and progress rating of A, B, or C. The proportion necessary for compliance shall be raised to 75% by 1 January 2025. Verification for compliance shall be calculated according to the annual volumes of marine ingredients purchased. The first calculation of annual volumes shall be performed in context with the audit in 2023 for annual volumes purchased in 2022.	Major Must

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Section	Principle	Criteria	Level
A 5.3.2.4	Can the compound feed manufacturer provide, on request, information on the composition and content of marine ingredients in the finished product?	When requested, the compound feed manufacturer shall provide the compound feed buyer with information on composition and content of marine ingredients in the finished compound feed. This shall include the origin of all marine ingredients used (originating from either reduction fisheries or industrial byproducts) in the compound feed. This aggregated information shall enable the customer of compound feed intended for aquaculture to calculate their fish-in/fish-out ratio. N/A for production of compound feed intended for livestock.	Major Must
A 5.3.3	**Marine ingredients from byproducts**		
A 5.3.3.1	If derived from byproducts of captured fisheries, are marine ingredients free from species categorized by the IUCN Red List as “Endangered” or “Critically Endangered (or higher)”, and also free from species which appear in Appendix 1 of CITES? Further, are the marine ingredients free from byproducts from any IUU fisheries?	Marine ingredients derived from byproducts of captured fisheries shall not contain species which are categorized by the IUCN Red List as “Endangered” or “Critically Endangered (or higher)”, nor any species which appear in Appendix 1 of CITES (go to “Class ACTINOPTERI”). Further, the ingredients shall not include byproducts from any IUU fisheries. Accompanying documentation by the supplier of marine ingredients shall indicate compliance.	Major Must
A 5.3.3.2	Are marine ingredients derived from byproducts of the processing of species from aquaculture traceable with regards to species of origin and country of origin?	Marine ingredients derived from byproducts of the processing of species from aquaculture shall be traceable with regards to species of origin and country of origin.	Major Must

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Section	Principle	Criteria	Level
A 5.3.3.3	Does a minimum of 60% of the purchases of marine ingredients derived from byproducts originate from responsible fisheries?	A minimum of 60% of the purchases of marine ingredients derived from byproducts and used to produce compound feed should originate from responsible sourcing. Responsible sourcing may be verified via schemes as recognized by the Global Seafood Sustainability Initiative (scope fisheries) or accepted under the MarinTrust program. The proportion necessary for compliance should be raised to 75% by 1 January 2025. Verification for compliance shall be calculated according to the annual volumes of marine ingredients purchased. The first calculation of annual volumes should be performed in context with the assessment in 2023 for annual volumes purchased in 2022.	Recom.

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6.4 Quantitative antimicrobial use indicator

Metric	Antimicrobial use in the grow-out stage in aquaculture production
Definition	This indicator describes the use of antimicrobials administered to species during the grow-out stage.
Purpose	• Understanding the use of antimicrobials overall and in delimited areas (peer group) • Promoting, when agreed upon in the peer group, the communication of no use of antimicrobials, if the case • Understanding the diseases and antimicrobials used for specific species/regions • Evaluating the classification of antimicrobials used (WHO/OIE list of antimicrobials and respective classification)
Information to be recorded	To record the antimicrobial metrics, the producer shall record treatment events with the following data: • Registration date of the treatment1 • Antimicrobial used (active ingredient) • Amount of antimicrobial used in the treatment (active ingredient) • Registration of a diagnosis justifying the treatment • Reporting that the producer is aware to which batch the treatment was given to • Vaccination status of the species2 • If previously vaccinated: What disease(s) was/were the vaccine intended to protect against? • If previously vaccinated: Indication on the effectiveness of the vaccine against the target disease [1] For IFA, the amount of antimicrobial used in the complete treatment for a given time period is registered. For IDA, the amount of antimicrobial used per day is registered (treatments spanning several days shall be split into individual days and amounts of antimicrobials used in a single treatment). [2] Had the organism been previously vaccinated?
IDA-related information*	The data shall be recorded with a GLOBALG.A.P. compatible FMS that will ensure that the data is transferred to the GLOBALG.A.P. Secretariat. The FMS shall enable the correct conversion of units so that the GLOBALG.A.P. Secretariat can receive the data. For antimicrobial identification, the OIE list retrieved from the GLOBALG.A.P. IT systems shall be used.
Frequency to record	After each treatment event has occurred. Treatment events to be recorded separately.

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Frequency to report to the GLOBALG.A.P. Secretariat*	Monthly – at the end of a calendar month, the GLOBALG.A.P. Secretariat shall receive the antimicrobial information associated with the treatment. If no antimicrobials were used, this fact shall also be reported.
Type of output*	An individual historical report, a report with data of a single producer showing trends in antimicrobial use over time: • Kg of antimicrobials (active ingredient) compared to biomass at harvest A benchmarking or comparison report between peer producers, comparing amounts of antimicrobials used by different producers near the producer's location. Comparison on a monthly level with peer producers' average antimicrobial use intensity in terms of percentile. Within a peer group, the indicator provides a notion of the range of distribution of antimicrobial use under similar circumstances. Peer producers are anonymized.

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6.4.1 Antimicrobial-related P&Cs in IFA for aquaculture

Section	Principle	Criteria	Level
AQ 20.02.01	An aquaculture health plan (AHP) is available, updated during the last 12 months, for the last production cycle, or whenever new medicines or treatments not previously used have been added.	An AHP shall be available on the site. A certified veterinarian/aquatic animal health professional recognized by a competent authority shall approve the AHP. Name, affiliation, and dated signature shall be included in the AHP. A certified veterinarian/aquatic animal health professional is the professional responsible for health management on the farm who has the legal authority to diagnose disease and prescribe medication. This definition applies to all references to a veterinarian throughout the standard documents. The AHP shall be updated either: a) Annually b) For each production cycle, if farmed aquatic species are at the farm for a period shorter than one year c) Whenever any of the content of the AHP requires updating (e.g., inclusion of new medicines or treatments) The plan shall include but is not restricted to the following: […] 2. Potential diseases, including corresponding preventive measures of disease spread and disease mitigation 3. Vaccination protocols, which shall include available vaccines suitable for preventing or reducing possible diseases which could occur in this region, where applicable. If effective vaccines are available for a recurring disease, vaccination shall be preferred over therapeutic treatments. […] 5. Medicines and treatments that may be used at the farm, including medicine name, active substance, indication, supplier, administration method, dosage, and pre-harvest withdrawal period.	Major Must

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Section	Principle	Criteria	Level
		6. Pre-harvest withdrawal period […] 10. Risk assessment of medicinal residues in relation to food safety issues and potential impact on wild stocks around the farm […] 15. Frequency of monitoring of sensitivity/resistance and rotation of medicines to avoid antimicrobial resistance (AMR), where applicable […] 17. Internal procedure for disease breakout notification, including who will be notified 18. **Antimicrobials to be used under the** judgement, prescription, and supervision of a veterinarian/aquatic animal health professional and if microbial sensitivity results (historic antibiogram) demonstrate that the selected antimicrobial is the only efficient treatment option. The veterinarian/aquatic animal health professional shall give justification in writing for each occasion of this use. If there is such use, there shall be evidence of communication from the producer's certified veterinarian/aquatic animal health professional instructing the feed suppliers to mix prescribed antimicrobials into compound feed. It is the responsibility of the farmer to inform an external prescribing veterinarian or aquatic animal health professional of this requirement. […]	
AQ 20.02.08	The hatchery/farm has in place a system to monitor and register farmed aquatic species' health and welfare indicators and all disease occurrences.	A system to monitor and register farmed aquatic species' health and welfare indicators and all disease occurrences at hatcheries/farm sites shall be in place. The register shall contain at least: - Observations - Diagnosis - **Treatment** - Mortalities […]	Major Must

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Section	Principle	Criteria	Level
AQ 20.03	**Treatments**		
AQ 20.03.01	If effective vaccines are available for a recurring disease, vaccination is preferred over therapeutic treatments.	Producers shall use only those vaccines that are permitted by the relevant competent authority for use in aquaculture and for the named species. A list of all vaccines that may be used at the farm shall be available as part of the aquaculture health plan (AHP). […]	Major Must
AQ 20.03.02	Producers use only medicines and treatments that are permitted by the relevant competent authority and stipulated in the aquaculture health plan (AHP) for use in aquaculture and for the named farmed aquatic species.	Producers shall use only those medicines and treatments that are permitted by the relevant competent authority for use in aquaculture and for the named species. A list of all medicines and treatments that may be used at the farm shall be available as part of the AHP. […]	Major Must
AQ 20.03.04	Vaccines, medicines, and treatments used at the farm are authorized and/or prescribed by a certified veterinarian/aquatic animal health professional.	Vaccines, medicines, and treatments used at the farm shall be authorized and/or prescribed by a certified veterinarian/ aquatic animal health professional. Application has to be carried out according to label instructions and veterinary prescriptions, following the instructions included in the aquaculture health plan (AHP). Where the prescription follows the cascade principle, this shall be clearly recorded with justification for each treatment.	Major Must
AQ 20.03.06	Neither natural nor synthetic hormones nor antibiotic agents are used for the purpose of growth promoting.	The producer shall be able to demonstrate that hormones and antibiotic agents are used properly and not for promoting growth.	Major Must
AQ 20.03.07	When stocks are vaccinated, it is according to the aquaculture health plan (AHP) […].	The vaccination records shall be available for the certification body (CB) audit.	Major Must

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Section	Principle	Criteria	Level
AQ 20.03.08	Antibiotic agents are only applied following the diagnosis of an infectious bacterial disease.	Antibiotic agents shall not be used prophylactically, but shall be applied as a therapeutic treatment only where an infectious bacterial disease is diagnosed. Refer to the aquaculture health plan (AHP).	Major Must
AQ 20.04	**Treatment records**		
AQ 20.04.01	The producer maintains up-to-date records of medicines and treatment purchases or deliveries, including medicated feed, and records of administering medicines/medicated feed to farmed aquatic species.	Any and all medicines and medicated feed in use/store shall be recorded in accordance with standard requirements, and records shall be in place. The purchase record shall include date of purchase, name of product, quantity purchased, batch number, expiry date, and name of supplier. The administration record shall include batch number, date administered, identity of farmed aquatic species group treated, quantity or biomass of farmed aquatic species treated, dosage, method of administration and total quantity of medicine used, date treatment finished, date withdrawal period completed, earliest date the farmed aquatic species are available for consumption, name of the person(s) who administered the medicine by date.	Major Must
AQ 20.04.02	The producer is able to provide a complete history and current overview and trend analysis of farmed aquatic species treatments and application methods.	All farmed aquatic species treatments and treatment trend analysis, shall be recorded and carried out according to the aquaculture health plan (AHP). Typical trend analysis may include: - Where antibiotics are used, a trend relating to the quantity of **active ingredient versus harvest tonnage can be calculated for defined batches**. - Where chemical compound treatments are used, a trend relating volumes used versus farmed aquatic species numbers produced can be calculated for defined batches. - Number of treatments and frequencies of specific disease treatments	Major Must

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6.5 Quantitative energy use indicator

Metric	Energy required to supply aquaculture products for human consumption
Definition	This indicator describes the amount of energy used.
Purpose	• Monitoring on-farm energy use • Planning for energy efficiency use at farm level • Identifying renewable energy sourcing • Evaluating energy efficiency
Information to be recorded*	To record the energy metrics, the producer shall record the following data: • On-farm energy use • Source identification • Energy consumed from each source identified • Amount of renewable energy from the source (Wood chips shall be considered sustainable only if they are the byproduct of wood processing. The forests shall not have been cut solely for the purpose of producing wood chips.) • Date of energy use (If a specific date cannot be given, the date can be the last date of the month.) • Site where the energy was used
IDA-related information*	The data shall be recorded with a GLOBALG.A.P. compatible FMS that will ensure that the data is transferred to the GLOBALG.A.P. Secretariat. The FMS shall enable the correct conversion of units so that the GLOBALG.A.P. Secretariat can receive the data. For energy source reporting, a list of energy sources retrieved from the GLOBALG.A.P. IT systems shall be used. This list is constantly updated and shall be received from the FMS connected to the GLOBALG.A.P. IT systems.
Frequency to record	At minimum on a monthly basis. Information can be aggregated per site per month if more accurate recording of energy use and generation is not possible.
Frequency to report to the GLOBALG.A.P. Secretariat*	Monthly – at the end of a calendar month, the GLOBALG.A.P. Secretariat shall receive the energy abstraction and use information. Information can be aggregated per site per month if more accurate recording of energy use and generation is not possible.

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Type of output*	An individual historical report, a report with data of a single producer showing trends in energy use over time: • Total amount of energy used compared to biomass at harvest • Amount of energy used per source compared to biomass at harvest • Share of renewable energy in energy use A benchmarking or comparison report between peer producers, comparing amounts of energy used by different producers near the producer's location. Comparison on a monthly level with peer producers' average consumption and the producer's energy use and generation intensity in terms of percentile. Within a peer group, the indicator provides a notion of the range of distribution of energy use and generation under similar circumstances. Peer producers are anonymized.

6.5.1 Energy efficiency-related P&Cs in IFA for aquaculture

Section	Principle	Criteria	Level
AQ 07.06	**Energy efficiency** *Farming equipment shall be selected and maintained for optimum energy efficiency. The use of renewable energy sources should be encouraged.*		
AQ 07.06.01	On-farm energy use is monitored.	here shall be records of on-farm energy use (e.g., invoices detailing energy consumption). The producer shall be aware of where and how energy is consumed on the farm and through farming practices. Trend analysis of energy use shall be available (listed per cycle and per biomass).	Minor Must
AQ 07.06.02	Based on the results of the monitoring, there is a plan to improve energy efficiency on the farm.	A documented plan identifying opportunities to improve energy efficiency shall be available (e.g., implementing insulation where needed, revising transport planning to optimize use of energy, etc.).	Minor Must
AQ 07.06.03	The plan to improve energy efficiency considers minimizing the use of nonrenewable energy where possible.	Producers shall consider reducing the use of nonrenewable energies to a minimum where possible and using renewable energy instead. Identification of renewable energy sourcing possibilities shall be available. The use of wood chips must be taken with caution, as no forests shall be cut to produce them.	Minor Must

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6.6 Quantitative escape indicator

Metric	Escapes during the grow-out stage in aquaculture production
Definition	The estimated number of aquatic species or estimated biomass that escaped from the aquaculture production facility to the surrounding environment during the grow-out stage
Purpose	• Understanding the efficiency of production's management in avoiding escapes • Continuously aiming for zero escapes and the reinforcement required after an escape incident affected by climate change, e.g., sudden temperature change, sudden unexpected strong storms
Information to be recorded*	To record the escape metrics, the producer shall record the following data: • Registration date of the escapes • Reporting on the number of escapes either in biomass or number of escaped individuals ○ In case the producer uses a number of escaped individuals, the producer shall indicate the average biomass of an escaped individual • Cause of escape • Reporting if the escaped organisms were under treatment at the time of escape (yes/no) • Reporting that the producer is aware which batch the escape happened from
IDA-related information*	The data shall be recorded with a GLOBALG.A.P. approved FMS that will ensure that the data is transferred to the GLOBALG.A.P. Secretariat. The FMS shall enable the correct conversion of units so that the GLOBALG.A.P. Secretariat can receive the data.
Frequency to record	Each time escapes are observed
Frequency to report to the GLOBALG.A.P. Secretariat*	Monthly – at the end of a calendar month, the GLOBALG.A.P. Secretariat shall receive the escape-related data. If there were zero escapes, this fact shall also be recorded and shared with the GLOBALG.A.P. Secretariat.

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Type of output*	An individual historical report, a report with data of a single producer showing trends in escapes over time: • Escaped individuals vs total number of individuals harvested • Metric tons of escapes • Metric tons of escapes compared to biomass at harvest A benchmarking or comparison report between peer producers, comparing escape numbers and intensity of escapes to relevant peer producers. Within a peer group, the indicator provides a notion of the range of distribution of escapes under similar circumstances. Peer producers are anonymized.

6.6.1 Escape-related P&Cs in IFA for aquaculture

Section	Principle	Criteria	Level
AQ 20.09.02	Measures are in place to prevent the escape of farmed stock into the local watercourse or ingress of indigenous species into the farmed aquatic species holding areas.	The contingency plans, records of all escaped farmed aquatic species for the previous 12 months, and **documentation that escape incidents have been reported to the authorities shall be in place for all sites**. The hatchery/farm shall have an effective and documented procedure to prevent accidental release of stock into the environment. Where applicable, pen structures and moorings shall be inspected according to a documented schedule based on the risk assessment. Routine maintenance and repair or replacement shall be actioned and recorded.	Minor Must
AQ 07.01.01	The producer has a wildlife management and conservation plan that acknowledges the impact of farming activities (including possible escapes) on the environment.	There shall be a documented action plan that aims to enhance habitats and maintain biodiversity, **aiming for zero escapes**. This can be either an individual plan or a regional activity that the farm participates in or is covered by. The action plan shall pay special attention to areas of environmental interest being protected and make reference to legal requirements, where applicable.	Minor Must
AQ 07.03.01	The environmental management plan (EMP) includes a **contingency plan and a standard operating procedure to avoid escape of farmed aquatic species into the sea or local freshwater course.**	Procedures to avoid escapes shall be in place, paying special attention to climate change and taking into account site history. - Precautions shall be in place to prevent the erosion of dams or channels that could lead to subsequent escapes. - The infrastructure shall be calculated for high flood levels. Evidence of high flood levels in calculations shall be presented. - Additional infrastructure to prevent escapes shall be part of the preventive measures.	Minor Must

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Section	Principle	Criteria	Level
		- The EMP shall include a contingency plan. The contingency plans and records of all escaped stock for the previous certification cycle shall be available, along with confirmation that all escapes have been reported to the authorities for all sites. Information reported to the authorities shall include biomass, health status, and any food safety risk associated with the escaped farmed aquatic species. The hatchery/farm shall have an effective and documented procedure for preventing accidental release of the farmed aquatic species into the environment. Where applicable, pen structures and moorings shall be inspected according to a documented schedule based on the risk assessment. Routine maintenance, and repair procedures as necessary, shall be performed and recorded. Contingency plans should include plans for recapturing escaped farmed aquatic species.	

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