

CRITERION 2.7 – WATER QUALITY

Revised criterion draft

Key considerations

The water quality revision aims to define indicators that collectively address the impacts of aquaculture on water quality in all major production systems that discharge into different water types. A Technical Working Group is supporting ASC with this revision. Initial TWG discussions resulted in three separate recommended approaches for revised indicators of water quality for production systems discharging into three categories of receiving waters: (i) lakes and reservoirs, (ii) flowing fresh waters and (iii) saltwater. Following deliberations since the last consultation on these approaches, the TWG developed a proposal for revised indicators. The proposal seeks further harmonisation through a more fundamental categorisation of receiving waters according to their nutrient retention capacity based on hydraulic residence time, differentiating between still/slower flowing ('lentic') and faster flowing ('lotic') systems. In this context, the indicators within the proposal have been developed to identify the nutrient retention capacity of the receiving waterbody and the susceptibility of at-risk water bodies to additional nutrient inputs. Where relevant, additional assimilative capacity assessment and coordinated area management actions are required to reduce the rate of change and prevent shifts in the trophic status of a waterbody.

Considering the cumulative nature of eutrophication and the lentic-lotic categorisation, the TWG focused its deliberations on four sub-criteria which, working as a whole in the proposal, support coordinated area management actions at a landscape level. Those sub-criteria are described in the table below:

Sub-Criterion	Objective	Relevant Indicators
1) Landscape-level pressures, states, and impacts (lentic systems)	To address cumulative sectoral aquaculture eutrophication pressures and impacts based on the trophic status and assimilative capacity of lentic water bodies with higher nutrient retention characteristics	2.7.2 to 2.7.6
2) Farm-level pressures and impacts (lentic and lotic systems)	To address more localised eutrophication pressures and impacts at farm-level in lentic and lotic water bodies	2.7.7 to 2.7.12 and 2.7.16 to 2.7.26
3) Farm-level nutrient 'input-output management' (IOM; lentic and lotic systems)	To limit nutrient inputs and outputs in order to mitigate ecological impacts	2.7.27 to 2.7.31
4) Area-based management (lentic systems)	To achieve collective sectoral responses to cumulative pressures and impacts at landscape (waterbody unit of management: WUM) level.	2.7.13 to 2.7.15

The four sub-criteria correspond with elements of an extended 'DPSIR' (Driver, Pressure, State, Impact, Response) framework first suggested for the development of environmental indicators by the Organisation for Economic Cooperation and Development (OECD)¹. The proposal differentiates landscape and farm-level indicators of Pressure, State and Impacts ('PSI' indicators) in Sub-Criteria 1 & 2 and Response indicators at farm-level and landscape level (i.e. coordinated) in Sub-Criteria 3 and 4. In line with this approach, the proposal seeks to simultaneously look at impacts as well as require preventative/precautionary measures. Consequently, some indicators are proposed to ensure farms understand their context and potential impacts (e.g. the ones that call for the Unit of Certification, or UoC, to "identify" certain conditions) and those indicators are connected to response indicators within the proposal.

Overall, ASC believes that the proposal successfully achieves the aim of developing a method for water quality management that focuses strongly on cumulative impacts and the carrying capacity of a waterbody. This will strengthen the position of ASC farms when addressing water quality impacts.

SCOPE CRITERION 2.7 – FARMS USING FEED OR FERTILISERS AND RELEASING EFFLUENTS^{2 3}

Rationale – Eutrophication and its consequences are amongst the most serious environmental problems facing humanity today ([Stephen et al., 2015](#)). Excessive inputs of nitrogen (N) and phosphorus (P) profoundly alter the composition and functioning of freshwater and marine ecosystems, leading to shifts from long-lived macro-algae to bloom-forming toxic algae and other nuisance species. Water quality impacts, particularly oxygen depletion (hypoxia), can then kill sensitive fish species with cascading effects on entire aquatic ecosystems and overall loss of biodiversity at local and regional scales. The general deterioration of water quality may also preclude water use by other industries and communities.

The release of nutrients (N & P) and particulate matter (TSS) from fed and fertilised aquaculture systems can contribute to eutrophication and other impairments to water quality (e.g., taste and odour problems). The severity of these effects is contingent on many factors, including the depth and location of the waterbody as well as nutrient inputs from other natural and anthropogenic sources.

Aquaculture contributions to eutrophication can be limited by ensuring nutrient loads in farm effluents do not have excessive localised impacts (e.g. through oxygen depletion), or cumulatively exceed the assimilative capacity of the wider waterbody. Various in-farm measures can also reduce nutrient loading by limiting the amount of N and P released per unit of production.

Intent – To assess and minimise risk that nutrients and suspended solids released from a farm negatively impact the receiving waterbody and adversely affect associated ecosystem structure and function.

¹ <https://www.oecd.org/env/indicators-modelling-outlooks/24993546.pdf>

² Releasing effluents: see Definition List

³ For farms which never release effluents, the requirements in this criterion do not apply.

Indicators

Indicators	
Indicator 2.7.1	The UoC shall identify the receiving water (RW) body as lentic ⁴ (e.g., lake or reservoir) or lotic ⁵ (e.g., flowing river); for those with a mean current velocity of <0.1m/sec, the UoC shall demonstrate that the hydraulic residence time of the RW is <5 days in order to classify as lotic, following the method outlined in Annex 1 .

Scope Indicators 2.7.2 - 2.7.15 – farms using feed or fertilisers and releasing effluents to lentic systems

Indicators	
Indicator 2.7.2	The UoC shall identify a Waterbody Unit of Management ⁶ (WUM), with coherent characteristics in terms of natural processes and land use, using the methodology outlined in Annex 2 ; unless the RW is determined a hydrodynamically isolated embayment (HIE) (Annex 2), in which case the WUM equates to the entire HIE by default.
Indicator 2.7.3	The UoC shall present ⁷ a 24-month initial baseline survey characterising its WUM, using the monitoring methodology outlined in Annex 3 , for the following: <ul style="list-style-type: none"> - secchi disk (SD), chl-a levels and limiting nutrient(s): N-, P- or co-limited (Annexes 3.2 & 3.3 & 4.1) - trophic status based on limiting nutrient(s) and chl-a: hyper-eutrophic, eutrophic, mesotrophic, oligotrophic, or ultra-oligotrophic (Annex 3.2) - DO and temperature depth profiles, including the depth of the zone of oxygen depletion i.e., DO ≤4mg/l and anoxia i.e., DO ≤2mg/l (Annex 3.2) - history of adverse turnover events over the last 10 years (Annex 3.4)
Indicator 2.7.4	At the WUM-level, the UoC shall annually demonstrate, through quarterly monitoring of the limiting nutrient(s), SD and chl-a over the past 24 months, using the methodology outlined in Annex 4.2 , that there is no upward transition of trophic status compared with the initial WUM baseline survey characterisation (2.7.3).
Indicator 2.7.5	At the WUM-level, the UoC shall annually demonstrate, through quarterly monitoring of TN, TP and chl-a over the past 24 months (Annex 4.3), that neither

⁴ Lentic: see Definition List

⁵ Lotic: see Definition List

⁶ WUM: see Definition List

⁷ Only one survey is required per WUM i.e., if this has already been carried out, for example by other ASC certified operations in the WUM, no additional baseline survey is needed.

	the limiting nutrient(s) nor chl-a indicates an upward rate of change of > 30% compared with the previous 24-month WUM monitoring survey.
Indicator 2.7.6	At the WUM-level, the UoC shall annually identify, through quarterly monitoring of DO over the past 24 months ⁸ (Annex 4.4), whether the zone of oxygen depletion ⁹ or anoxia ¹⁰ indicates a decrease in depth of > 10% compared with the previous 24-month WUM monitoring survey.
Indicator 2.7.7	At the farm level, the UoC shall annually demonstrate, through quarterly monitoring of the limiting nutrients and chl-a over the past 24 months (Annex 4.2), that there is no upward transition of trophic status compared with the initial WUM baseline survey characterisation (2.7.3).
Indicator 2.7.8	At the farm level, the UoC shall annually demonstrate, through quarterly monitoring of TN, TP and chl-a over the past 24 months (Annex 4.3), that neither the limiting nutrient(s) nor chl-a indicates a rate of change of > 30% compared with the previous 24-month farm-level monitoring survey.
Indicator 2.7.9	At the farm level, the UoC shall annually identify, through monthly monitoring of DO immediately downstream of the farm over the past 24 months (Annex 4.4), whether the zone of oxygen depletion ⁸ or anoxia ⁹ indicates a decrease in depth of > 25% compared with the previous 24-month farm-level monitoring survey.
Indicator 2.7.10	<i>Indicator scope: diffuse effluent release only</i> The UoC shall demonstrate, through daily monitoring of DO concentration and saturation on farm, using the methodology outlined in Annex 4.5 , that the weekly average of daily DO saturation is ≥ 65% in freshwater and ≥ 70% in seawater ¹¹ .
Indicator 2.7.11	<i>Indicator scope: diffuse effluent release only</i> The UoC shall annually demonstrate, using the DO measurements from 2.7.10, that ≤5% of the weekly averages of daily DO concentrations are <2mg/l.
Indicator 2.7.12	<i>Indicator scope: cages</i> The UoC shall maintain open culture systems in water that is at least twice the cage depth or where the bottom of the cage is ≥ 10m above the waterbody bed, whichever is less.
Indicator 2.7.13	The UoC shall, using the source apportionment methodology outlined in Annexes 5.1 - 5.3 , present ¹² modelling of the total aquaculture sectoral

⁸ Unless SD in previous 24-month WUM monitoring survey indicates >10m, in which case quarterly monitoring of SD to demonstrate no drop <10m is sufficient.

⁹ i.e., depth at which DO falls below 4mg/l (see also 2.7.3)

¹⁰ i.e., depth at which DO falls below 2mg/l (see also 2.7.3)

¹¹ Water bodies with salinities >20 psu (practical salinity unit) shall be considered as seawater for this indicator.

¹² Only one model is required per WUM i.e., if this has already been carried out, for example by other ASC certified operations in the WUM, no additional model is needed.

	<p>contribution of limiting nutrient(s) load to the WUM over the previous 24 months, if:</p> <ul style="list-style-type: none"> - the WUM is ≤ 5 index points below a TSI limiting nutrient or chl-a breakpoint, indicating an approaching upward transition of trophic status i.e., approaching the assimilative capacity limit of the waterbody, OR - modelled limiting nutrient(s) or chl-a concentration increase $>20\%$ (2.7.5 and 2.7.8), OR - the depth of the zone of oxygen depletion¹³ or anoxia¹⁴ has decreased by $\geq 25\%$ (2.7.6 and 2.7.9), OR - there has been >1 adverse turnover event in 10 years (2.7.3).
Indicator 2.7.14	If modelling of the aquaculture sectoral contribution is required (2.7.13), the UoC shall model the total aquaculture sector BOD (Annex 5.4).
Indicator 2.7.15	<p>If the aquaculture sectoral contribution (2.7.14) is $>30\%$, the UoC shall participate in an Area Management Agreement (AMA), including the following and using the methodology outlined in Annex 6:</p> <ul style="list-style-type: none"> - sharing of WUM- and farm-level water quality data - sharing of relevant modelling outcomes - coordinated management efforts, including a commitment to increase nutrient loading efficiency limits, in order to reduce the rate of change and prevent an upward transition of trophic status.

Scope Indicators 2.7.16 - 2.7.26 – farms using feed or fertilisers and releasing effluents to lotic systems

Indicators	
Indicator 2.7.16	<p><i>Indicator scope: point source effluent release only</i></p> <p>The UoC shall estimate the percentage “farm effluent volumetric flow rate (Q)” contribution to the receiving water “RW Q”, following the method outlined in Annexes 7.1 & 7.3, unless the RW flow rate is $> 1000\text{m}^3/\text{s}$ or TSS load is $>20\text{mg/l}$ at low flow.</p>
Indicator 2.7.17	<p><i>Indicator scope: point source effluent release only</i></p> <p>The UoC shall annually maintain estimation of percentage “farm effluent Q” contribution to the “RW Q” (2.7.16), unless the maximum percentage “farm effluent Q” contribution to the “RW Q” (2.7.16) is $<1\%$¹⁵ at RW low flow.</p>

¹³ i.e., depth at which DO falls below 4mg/l (see also 2.7.3)

¹⁴ i.e., depth at which DO falls below 2mg/l (see also 2.7.3)

¹⁵ A one-time confirmation of $<1\%$ is sufficient. The reason for this exception is to identify large rivers to which the volumetric flow rate input from farm effluents is negligible and, therefore, continued volumetric flow rate monitoring is not necessary. This also means that by default the percentage “farm effluent Q ” contribution to “RW Q ” is considered $< 10\%$ (2.7.18).

Indicator 2.7.18	<p><i>Indicator scope: point source effluent release only</i></p> <p>If the percentage “farm effluent Q” contribution to the “RW Q” estimated in 2.7.17 is > 10%, the UoC shall quarterly, and concurrently, estimate RW Q, TN, TP and TSS at RWFI and RWFE, following the method outlined in Annex 7.2.</p>
Indicator 2.7.19	<p><i>Indicator scope: point source effluent release only</i></p> <p>If TN, TP and TSS monitoring is required under 2.7.18, the UoC shall annually demonstrate that TN, TP or TSS measured over the previous 12 months indicates <25% increase between concentrations measured at RWFI and concentrations modelled at RWFA (Annex 7.3).</p>
Indicator 2.7.20	<p><i>Indicator scope: diffuse effluent release only</i></p> <p>The UoC shall annually demonstrate that TN, TP or TSS measured over the previous 12 months indicates <25% increase between concentrations measured immediately upstream (Annex 7.2) and modelled immediately downstream of the farm (Annex 7.3), unless the RW flow rate is > 1000m³/s or TSS load is >20mg/l at low flow (Annex 7.1).</p>
Indicator 2.7.21	<p><i>Indicator scope: point source effluent release only</i></p> <p>The UoC shall demonstrate, through daily monitoring of DO concentration and saturation at RWFE, using the methodology outlined in Annex 3.2, that the weekly average of daily DO saturation is ≥ 65% in freshwater and ≥ 70% in seawater¹⁶.</p>
Indicator 2.7.22	<p><i>Indicator scope: diffuse effluent release only</i></p> <p>The UoC shall demonstrate, through daily monitoring of DO concentration and saturation immediately downstream of the farm, using the methodology outlined in Annex 3.2, that the weekly average of daily DO saturation is ≥ 65% in freshwater and ≥ 70% in seawater¹⁷.</p>
Indicator 2.7.23	<p><i>Indicator scope: point source effluent release only</i></p> <p>The UoC shall annually demonstrate, using the DO measurements from 2.7.21, that at a maximum ≤5% of the weekly averages of daily DO concentrations are <2mg/l.</p>
Indicator 2.7.24	<p><i>Indicator scope: diffuse effluent release only</i></p> <p>The UoC shall annually demonstrate, using the DO measurements from 2.7.22, that ≤5% of the weekly averages of daily DO concentrations are <2mg/l.</p>
Indicator 2.7.25	<p><i>Indicator scope: point source effluent release only</i></p>

¹⁶ Water bodies with salinities >20 psu (practical salinity unit) shall be considered as seawater for this indicator.

¹⁷ Water bodies with salinities >20 psu (practical salinity unit) shall be considered as seawater for this indicator.

	The UoC shall demonstrate, through monthly DO monitoring at RWFA (Annex 7), that daily diurnal DO (DDDO) fluctuation is ≤65% (Annex 4.6), unless the RW flow rate is > 1000m ³ /s or TSS load is >20mg/l at low flow (Annex 7.1).
Indicator 2.7.26	<i>Indicator scope: cages</i> The UoC shall maintain open culture systems in water that is at least twice the cage depth.

Scope Indicators 2.7.27 - 2.7.31 – farms using feed or fertilisers and releasing effluents

Indicators	
Indicator 2.7.27	<i>Indicator scope: point source effluent release only</i> The UoC shall not release or dispose of nutrient containing materials e.g., sludge and sediments to public waterways, wetlands or other natural ecosystems.
Indicator 2.7.28	The UoC shall ensure feed fed contains <1% fines, using the methodology outlined in Annex 8 .
Indicator 2.7.29	The UoC shall adhere to system and species-specific limits on annual TN and TP load per ton of production (Annexes 9.1 & 9.2).
Indicator 2.7.30	<i>Indicator scope: point source effluent release only</i> The UoC shall ensure that all water released goes through a treatment system, and concentrations of settleable solids in effluent water is <3.3ml/L, if any of the following apply (Annex 9.3): <ul style="list-style-type: none"> - using aeration over >90% of the production cycle - exchanging >10% of water per day - exchanging water once per week or more during peak biomass
Indicator 2.7.31	<i>Indicator scope: point source effluent release only</i> The UoC shall ensure that all water released goes through a treatment system, capturing ≥65% of suspended solids originating from feed or fertiliser used, if any of the following apply (Annex 9.4): <ul style="list-style-type: none"> - using aeration over >90% of the production cycle - exchanging >10% of water per day - exchanging water once per week or more during peak biomass - using stocking densities >2kg/m³

Requirements on disclosure and reporting:	
Indicator 2.7.32 Reporting Symbol	<i>Indicator scope: lentic systems</i> The UoC shall report to ASC the outline of the WUM (2.7.2) and its initial WUM baseline survey trophic status (2.7.3), using the template provided on the ASC website.
Indicator 2.7.33 Reporting Symbol	<i>Indicator scope: lentic systems</i> The UoC shall annually report to ASC the WUM monitoring survey trophic status (2.7.4), using the template provided on the ASC website.

Acronyms

AMA: Area Management Agreement
 DDDO: Daily Diurnal DO
 HIE: Hydrodynamically Isolated Embayment
 RWFI: Receiving Water Farm Influent
 RWFE: Receiving Water Farm Effluent
 RWFA: Receiving Water Farm Afar
 Q: Volumetric Flow Rate
 SD: Secchi Disk
 TSI: Trophic Status Index
 TSS: Total Suspended Solids
 WUM: Waterbody Unit of Management

Definitions

Point source	“End of pipe” effluents from land-based or closed containment systems.
Diffuse source	Effluents from open “in-channel” systems e.g., cages.
Receiving water	The next waterbody receiving farm effluents, whether artificial or natural, outside of the farm licence perimeter.
Effluents, releasing effluents	Effluent release includes any movement of culture, treatment system or reservoir water from inside to outside the farm perimeter, regardless of the quality e.g., nutrient loading of the water. This includes point source and diffuse source effluents, land-based closed and open systems such as cages.
WUM	Waterbody Unit of Management within the farm’s receiving waterbody.
Lotic	An aquatic ecosystem with moving water such as streams, rivers and artificial canals. For the purpose of the ASC standard, this refers to water bodies with a hydraulic residence time of less than five days.

Lentic	An aquatic ecosystem with standing or slow flowing water such as lakes, or reservoirs. For the purpose of the ASC standard, this refers to water bodies with a hydraulic residence time of more than five days.
RWFI	Receiving water farm influent (upstream): RWFI is a reference or source point that ideally is not influenced by the farming operation, or is least influenced by the farm. Farms discharging to lotic systems, or cages positioned in lotic systems shall identify a point upstream of farm discharge or activity to serve as the reference point. Residual current patterns should also be considered in tidal settings.
RWFE	Farm effluent 'end-of-pipe' outflow, before combining with receiving water in a mixing zone.
RWFA	Receiving water farm afar (post mixing zone): RWFA is a point where the farm effluent has an influence in the receiving waters but is not in the immediate outfall/mixing zone. This location would be downstream in a river, or down the prevailing current pattern in a lake or reservoir or tidal estuary.