OLAMUR

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Authors		
Name	Organisation	E-mail
Dorothy J. Dankel*	SINTEF Ocean	dorothy.dankel@sintef.no
Ian Overton	Global Climate Forum	ian.overton@globalclimateforum.org
Anne Gaspers	SINTEF Ocean	anne.gaspers@sintef.no

*corresponding author

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Executive Summary

The OLAMUR project aims to advance offshore low-trophic aquaculture within multi-use scenarios as part of the Horizon Europe Mission Ocean program. This initiative seeks to integrate low-trophic aquaculture systems, such as seaweed and mussel farming, into existing maritime activities to enhance sustainability and economic viability while contributing to the United Nations Sustainable Development Goals (SDGs). The project employs a human-centered, participatory methodology to engage stakeholders from Germany, Denmark, and Estonia. Workshops in these regions focus on identifying relevant SDG targets and discussing the necessary indicators and data for reporting on these targets. This approach emphasises direct interaction and collaborative knowledge generation, fostering in-depth discussions and constructive debates. Key activities include conducting workshops to gather stakeholder insights, collecting and analysing data to support sustainability reporting, enhancing stakeholder knowledge and skills through guided discussions and collaborative exercises, and integrating sustainability principles to ensure long-term project impact. The OLAMUR project aims to position its demonstration sites as leaders in sustainable area planning by providing a comprehensive understanding of the 169 SDG targets, developing practical SDG applications within multi-use marine sites, and empowering stakeholders to address the EU Taxonomy and Corporate Sustainability Reporting Directive. Through its innovative methodology and focus on capacity building, the OLAMUR project seeks to create a sustainable and economically viable model for marine resource utilisation, contributing significantly to the global sustainability agenda.

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1. Table of Contents

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2. Introduction

This report details the methods and results of the workshops conducted within the OLAMUR project, involving stakeholders from Germany, Denmark, and Estonia. The workshops aimed to identify relevant Sustainable Development Goal (SDG) targets and discuss the necessary indicators and data required for reporting on these sustainability targets. The insights gained will assist the case areas in responding to the EU Taxonomy and Corporate Sustainability Reporting Directive. This approach positions the demonstration sites as leaders in understanding and addressing the complexity of the 169 SDG targets related to sustainable area planning.

2.1. A participatory approach

To effectively determine the relevance of the United Nations Sustainable Development Goals (SDGs) to the multi-use sites within the OLAMUR project, we developed a human-centered, participatory methodology. This analogue approach prioritizes direct interaction and collaborative knowledge generation among stakeholders. The design fosters in-depth group discussions and constructive debates by minimizing distractions inherent in digital environments. By consciously removing digital interfaces, we create a more focused and engaging space for participants to share perspectives, analyze challenges, and collectively identify connections between the project's activities and the broader SDG framework.

Furthermore, the chosen methodology integrates principles of group learning and capacity building. Recognizing the diverse experiences and familiarity levels with the SDGs among case study partners, the approach facilitates mutual learning and the development of a shared understanding. Through guided discussions and collaborative exercises, participants enhance their knowledge of the SDGs and their practical application within the OLAMUR project's multi-use sites. This emphasis on capacity building ensures that the insights generated are not only relevant but also contribute to the project's long-term sustainability and impact. The analogue nature of the approach encourages active listening, nuanced communication, and the development of strong working relationships among case study partners, which are crucial for successful collaboration and the effective integration of sustainability principles into the OLAMUR project.

2.2. The Case Study Contexts

The workshop series was held with each of the different case studies in the OLAMUR project. As shown in Table 1, Table 2, and Table 3, the cases combined either offshore wind farms or nearshore fish farms with low trophic aquaculture.

Table 1. Cast Study A: German case details

Offshore Wind Farm (OWF) combined with low trophic aquaculture	
Site location	Meerwind Süd/Ost OWF, Germany

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Wind farm operator	WindMW
Number of turbines	80
MW	288
Operation	Since 2015

Table 2. Case Study B: Danish case details

Offshore Wind Farm (OWF) combined with low trophic aquaculture	
Site location	Kriegers Flak OWF, Denmark
Wind farm operator	Vattenfall
Number of turbines	72
MW	604
Operation	Since 2021

Table 3. Case Study C: Estonian case details

Fish farm combined with low trophic aquaculture	
Site location	RedStorm OÜ, Ösel Aquafarms Saaremaa, Estonia

The case studies are shown in comparison in Table 4.

Table 4: Case studies in comparison.

Country	**Germany**	**Denmark**	**Estonia**
Sea basin	North Sea German EEZ (offshore)	Baltic Sea Danish EEZ (offshore)	Baltic Sea Estonian Sea (nearshore)
Condition of the water column	Open ocean/extremely exposed	Open ocean/exposed	Sheltered
Low trophic aquaculture	blue mussel (*M. edulis*) Eur. Oyster, (*O. edulis*) sugar kelp (*Saccharina latissima*) sea lettuce (Ulva sp.)	blue mussel (*M. edulis*) sugar kelp (*Saccharina latissima*) sea lettuce (Ulva sp.)	blue mussel (*M. edulis*) sea lettuce (*Ulva intestinalis*)

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Distance to next harbour	12.4 nautical miles (Helgoland)	8 nautical miles (Klintholm Havn)	2 nautical miles (Port of Veere)
Coordinates	54°23'0" N, 7°41'0" E	55°1'34" N, 12°56'20" E	58°27'41" N, 22°4'30" E

3. Methods

The overall aim of the method is to develop a rapid, but accurate, assessment of the relevance of each of the 169 targets and the associated 247 indicators to each multi-use demonstration case study in the OLAMUR project.

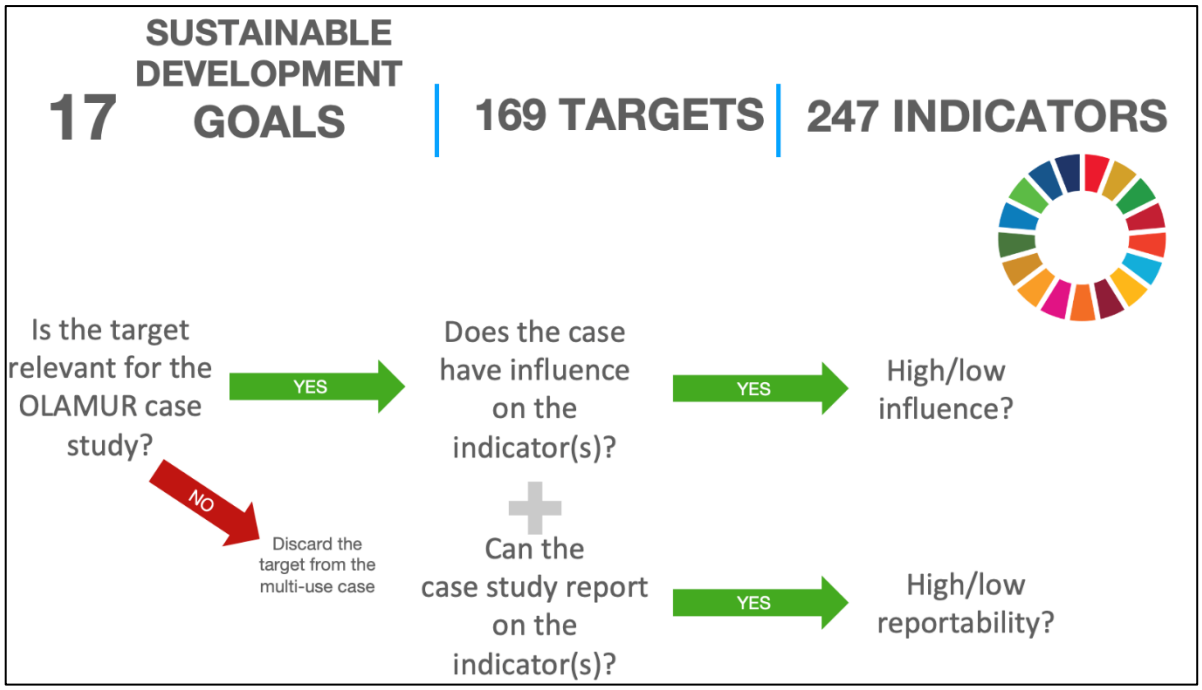

Figure 1: An overview of the flow of the methodology in the SDG Relevance-Tracing workshops.

When workshop participants identify an SDG target that is relevant for their case study, the workshop facilitator then reads the UN-recommended indicators for that specific target. Participants then discuss those indicators, including whether data is available for reporting on the indicator (high/low reportability) and whether the case study can "move the needle" for a regional or national report that includes that indicator (high/low influence).

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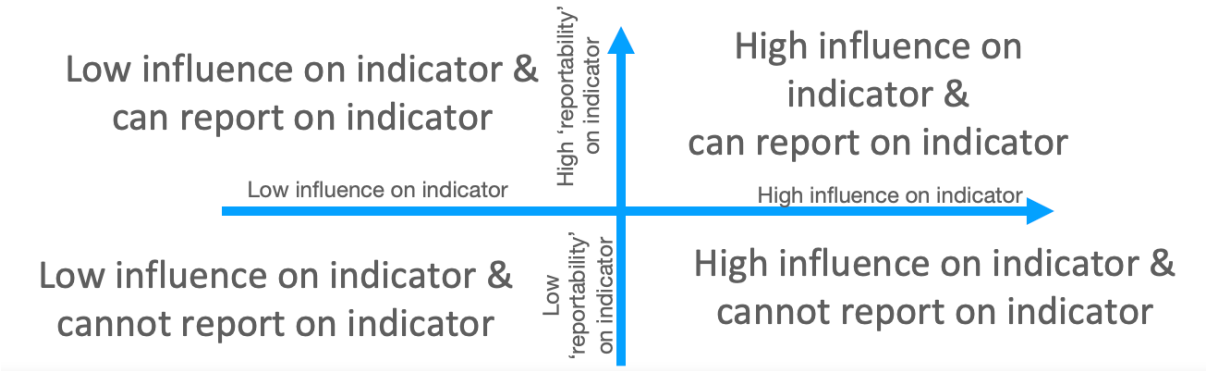

Figure 2: The scheme of qualifying SDG indicators for each relevant target.

3.1. Choosing the participants

Prior to the workshops, we carried out a stakeholder mapping exercise together with our OLAMUR partners who are leading the case studies. They helped us identify all stakeholders that affect and affected by the multiple uses, ensuring an inclusive engagement of relevant stakeholders across all levels and domains.

Denmark		**Germany**		**Estonia**	
Workshop date: October 5, 2023		Workshop date: December 2, 2024		Workshop date: August 12, 2024	
# of stakeholders	Role	# of stakeholders	Role	# of stakeholders	Role
2	Site operator	2	Site operator	4	Site operator
1	Case leader	1	Case leader	1	Case leader
2	Scientists	1	Scientists	5	Scientists
1	NGO			1	NGO
1	Project participant think tank			2	Government agency

Knowledge of the case and the case boundaries is key to SDG Relevance-Tracing. Therefore, before the workshop, each of the case leaders presented information about the case to the workshop facilitators in a pre-briefing. Each workshop followed the time plan as shown in the table below.

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Table 5: Workshop timeplan

Time	Minutes	Description of Exercise
9.30	10	Getting coffee, sitting down
9.40	5	Welcome, plan for the day, GDPR consent
9.45	30	Introduction to the SDGs and their relevance for business/our case through a debate on how to draw boundaries around the system, i.e. are we talking just about the specific, existing multi-use pilot demonstration or to include the value chains before / after entry into the multi-use system, or a conceptual up-scaling of the multi-use system in the future
10.15	120	Target and indicator relevance-tracing exercise
12.15	60	Lunch
13.30	180	Continued target and indicator relevance-tracing exercise
16.30	10	Closing, next steps

Figure 3: An overview of the three SDG Relevance-Tracing Workshops and the participants.

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4. Results

4.1. OLAMUR Case Study A (North Sea): Meerwind Süd/Ost (Germany)

The aquaculture facility at Case Study A is a small operation with 15 workers. It faces several challenges, including the inability to double mussel production due to restrictions in the national park (Target 2.3), the absence of gene banks for multi-use (MU) systems, and the historical context that mussel farms predate national parks, which otherwise would not allow their operation.

The primary goal of the multi-use at Case Study A is food production, with renewable energy production not being a primary objective.

The community on the island of Helgoland boasts high-standard tertiary water treatment via reverse osmosis. However, there are concerns about microplastics pollution from turbine blades affecting mussels, which impacts their marketability. Additionally, there is a need to manage nutrient removal carefully to avoid disrupting the natural eutrophication in the North Sea.

The workshop highlighted several challenges, including the lack of data on informal employment (Target 8.3.1) and the unfunded maintenance of restoration sites at offshore wind farms. No offshore wind farm energy is currently used in the aquaculture facility. Hereon provides a service for OLAMUR under Target 6.3.

Labor rights and safety (Target 8.8) are crucial for aquaculture operations. The involvement of numerous agencies in Germany complicates the permitting process, making investments challenging.

4.1.1. Relevance-tracing

In all, out of a possible 169 targes and 17 sustainable development goals, the participants of the workshop identified 29 targets within 12 sustainable development goals that are relevant for the German case study.

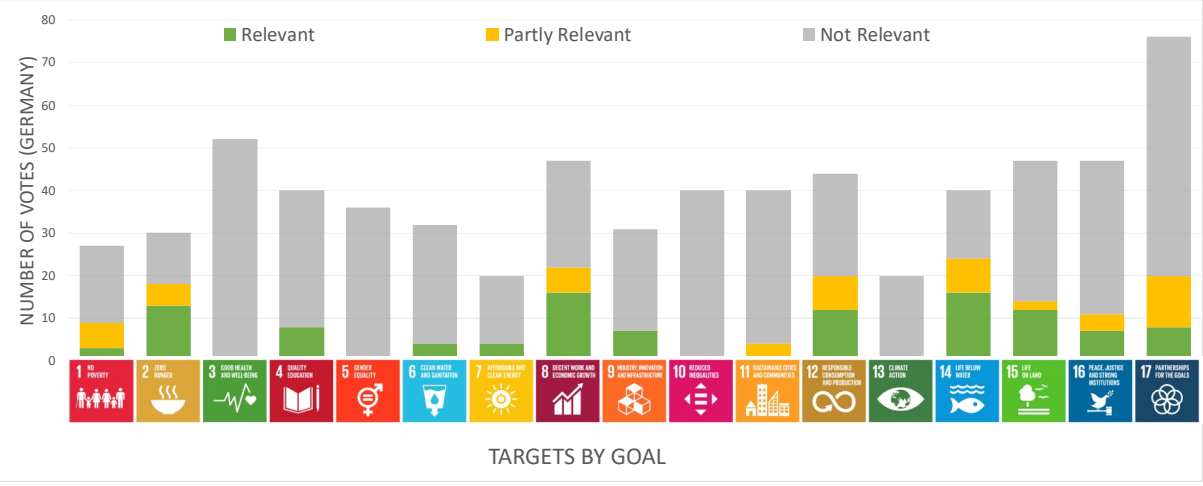

Figure 4: Summary of the votes across SDGs for Case Study A in Germany.

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4.2. Workshop reflections and future directions

Participants found the detailed review of SDGs interesting but noted inconsistencies and outdated aspects. There is a need to separate saltwater and freshwater indicators and emphasize transparency and public education on sustainability and food security.

Future efforts should focus on systemic change, ensuring that reporting leads to sustainable actions. Food system topics should be integrated into educational curricula, and involving more stakeholders can lead to richer discussions and insights.

The workshop highlighted the complexities and challenges in offshore aquaculture and the need for systemic changes to achieve sustainable multi-use in the offshore space. Continued collaboration and stakeholder engagement are essential for progress.

4.3. OLAMUR Case Study B (Baltic Sea): Kriegers Flak (Denmark)

The scope considered for the relevance-tracing workshop includes the site as it is today, which consists of a single long line of seaweed and a long line of mussels, compared to the future scale-up, which could potentially involve much higher commercial-scale production.

4.3.1. Relevance-tracing

In all, 50 SDG targets were considered relevant to the Case Study B by the participants, over 12 goals.

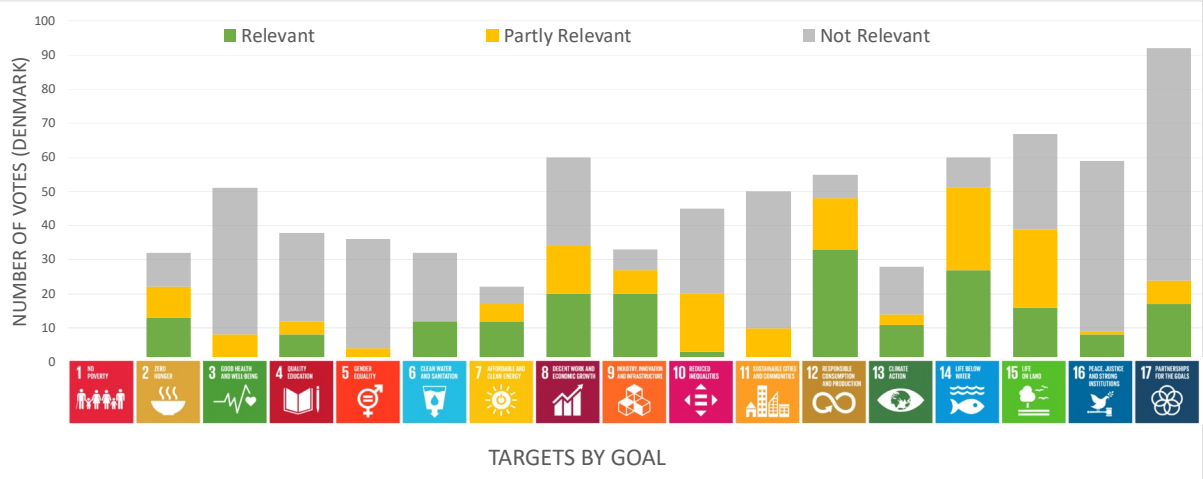

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Figure 5: An example from Case Study B, Denmark, and how the relevant indicators look on the reportability/influenceability quadrant map.

4.3.2. Workshop reflections and future directions

The post-meeting stakeholder reflection highlighted a rich and productive discussion, with participants feeling they had ample opportunity to express their views. One attendee noted improved organization compared to previous meetings, though they expressed uncertainty about the voting process and framework boundaries. Another participant raised concerns about potential misplacement of indicators in the third quadrant (low influence, low reporting ability).

Some found the task daunting but appreciated the process, noting that regulators had previously expressed skepticism about interest in sustainability documentation. It was suggested that thorough sustainability reporting could potentially increase interest. The ownership of a specific sea farm was discussed, with a proposal for a future joint venture model that would adhere to a

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partner's code of conduct. Data collection methods, including annual employee surveys on discrimination, were mentioned, along with questions about businesses' willingness to disclose such information publicly.

A recommendation was made for using the SDG tracker and Our World in Data as valuable resources for environmental data, noting their frequent updates. The group discussed the importance of documenting co-benefits from production to strengthen sustainable production and consumption goals. Surprisingly, many indicators seemed to be missing from SDG 14.

There was a focus on communications within a specific project, while another perspective emphasized the government's role in setting targets and the private sector's responsibility for granular reporting and local influence. It was noted that multi-sector projects often struggle to fit into existing reporting systems and regulatory frameworks, particularly regarding carbon capture and coastal restoration initiatives.

The discussion touched on the difficulty of making food waste less economically profitable and the challenges of localizing indicators that are often nationally focused. There was a strong emphasis on the need for developing scalable SDG targets and indicators, recognizing corporate sustainability as crucial for systemic change. The group also noted the sometimes clumsy wording of SDG targets and the importance of reporting on indicators that may seem obvious in certain regions but are globally relevant.

Challenges identified included maintaining objectivity as a moderator and questioning the usefulness of the fourth quadrant in the analysis. The group also reflected on methodological considerations, such as the timing of reading indicators in relation to voting on their relevance.

4.4. OLAMUR Case Study C (Baltic Sea): Ösel Aquafarm (Estonia)

The following reference statement (system boundaries of the case study workshop) was declared by the workshop participants: Case Study C is about a Rainbow trout farm that exports fish products; It is an experimental integrated multi-trophic aquaculture set-up (IMTA); mussels and seaweed are present as nutrient capture; there is potential for expansion to offshore wind farms as a multi-use case if emissions capture is effective.

Rainbow trout aquaculture in the Baltic Sea faces dual challenges of reducing emissions and complying with nutrient compensation requirements. The industry relies on smolts from inland recirculating farms and Denmark-sourced feed, with conventional feeds contributing significantly to greenhouse gas (GHG) emissions. A Swedish study demonstrated that replacing 60% of conventional feed proteins with Nordic-sourced alternatives (insects, blue mussels, and

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fava beans) reduced GHG emissions by 63% per kilogram of trout while maintaining growth rates. To address nutrient discharge regulations under HELCOM agreements, farms like OLAMUR's Site C (permitted for 186 tons) employ mussel cultures for biological compensation, despite lacking established markets for mussel biomass. Experimental integrated multi-trophic aquaculture (IMTA) systems combine trout with 25 seaweed lines (30m wide, 16m deep) to absorb excess nitrogen and phosphorus. Seaweed trials achieved 82–99% nutrient removal in wastewater, though commercial applications remain underdeveloped. Licensing bottlenecks persist, with >10-year waits for new permits due to strict eutrophication controls. While mussels and seaweed currently serve regulatory compliance rather than economic value, their integration into circular supply chains – potentially as feed ingredients or biofertilizers – could align environmental goals with market opportunities. The sector's expansion in offshore zones like the Gulf of Bothnia depends on demonstrating scalable emissions mitigation through feed innovation and IMTA systems

The operational setup at Site C includes 60-meter and 100-meter pens for rainbow trout, with adjacent lines for seaweed and mussels. This arrangement facilitates the integration of different species, promoting a balanced ecosystem.

4.4.1. Relevance-tracing

In all, 39 targets were deemed relevant for Case Study C by the participants, over 11 goals.

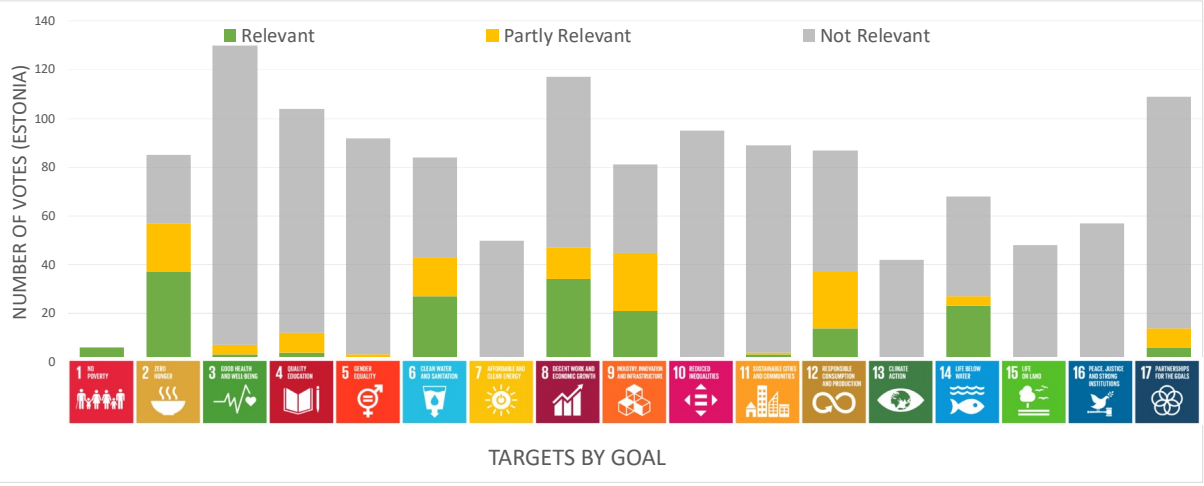

Figure 6: The summary of participant votes over targets in Case Study C, Estonia.

Site C, located in coastal waters, is an Integrated Multi-Trophic Aquaculture (IMTA) site adjacent to the only mariculture farm in the area, RedStorm, which cultivates rainbow trout. Within less than one square kilometer of the fish farm, mussels and seaweed (ulva) are also cultivated. The site is a demonstration of "co-use" of sea space for the OLAMUR project,

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involving three partners: RedStorm, Ösel Aquafarms, and UTartu. Currently, there are no operating offshore wind farms in Estonia.

The facilitator raised a critical question regarding governance: “How do we create incentives to encourage this industry, assuming alignment to SDGs?” While wind developers are willing to engage in aquaculture, they are reluctant to restart their Transmission System Operator (TSO) applications and redo their Environmental Impact Assessments (EIA) and Social Impact Assessments (SIA) to accommodate aquaculture adaptations.

Several SDG targets were discussed in relation to Site C:

Targets 1.4 & 5.a (Gender): Emphasizing “ownership and control over land and property,” which is not formulated for water tenure rights.

SDG 2: Interpreted to include aquaculture, raising questions about whether "hunger" refers solely to malnutrition.

Target 4.3: Training programs were skipped over but addressed in Target 4.4, highlighting the need for technical skills in aquaculture.

Estonian Gender Equality: No quotas for boards of public companies, managed by non-discrimination law and university oversight for EU grant applications.

Target 6.a.1: Relevant to OLAMUR but not the pilot, indicating an irrelevant indicator for a relevant target.

Goal 7: Less relevant without wind farms or energy generation.

Tourism: Not included, raising curiosity about its exclusion.

Target 14.a: Noted for its complexity.

Target 14.b: Assumed to include small-scale aquaculture facilities, with regulations indicating that facilities producing less than 200 tons do not require a license.

Target 15.5: Assumed to address terrestrial biodiversity only, not marine biodiversity.

Target 16.10: Requires sharing project data and publications, but the indicator is written for developing countries.

Target 17.6: Highlighted the imbalance between broad targets and narrow indicators.

Target 17.9: Relevant to OLAMUR if including “associated regions” technology transfer calls.

Target 17.17: Relevant target but the indicator (17.17.1) focuses solely on infrastructure, making it irrelevant.

The discussions in the Case Study C workshop highlight the complexities and challenges in integrating aquaculture with existing marine and coastal operations. Addressing these challenges requires careful consideration of governance, incentives, and alignment with SDG targets. Continued collaboration and stakeholder engagement are essential for progress in sustainable aquaculture practices.

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4.5. Comparative results across the Case Studies

We next wanted to see which indicators are common across the three case studies. This gives us an impression of a larger regional and international governance potential of indicators.

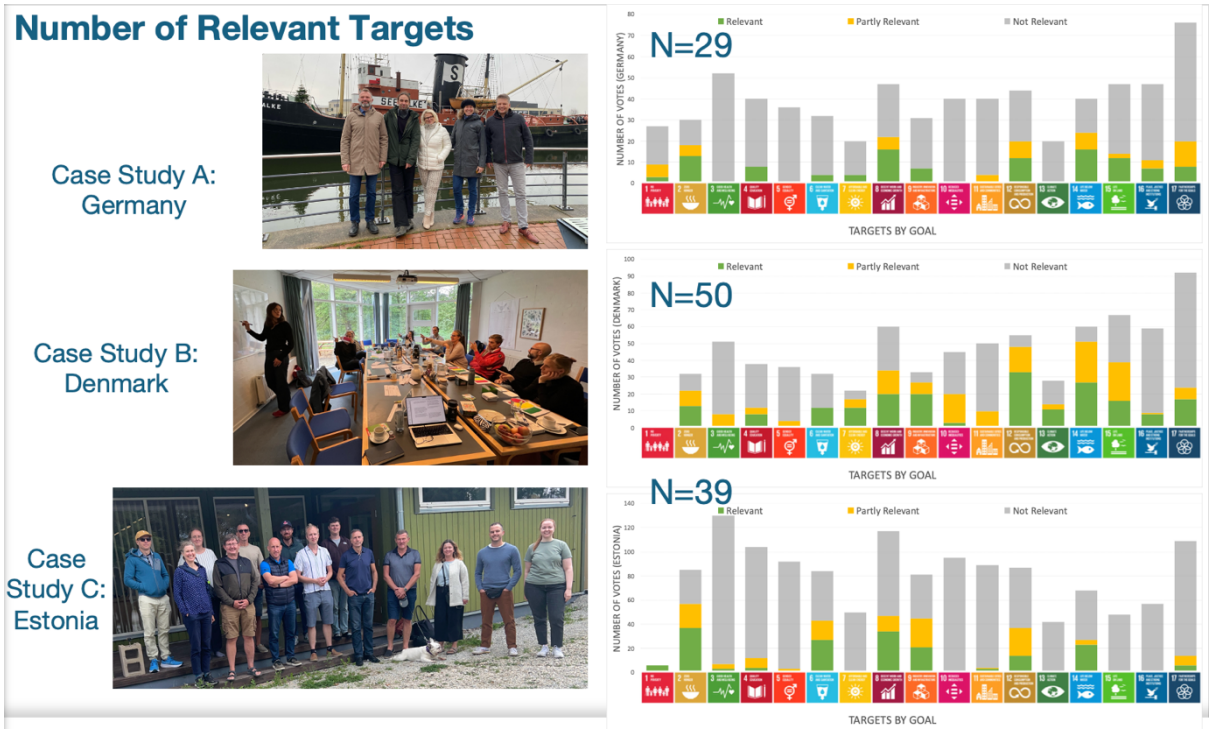

Figure 7: The overall results of relevant targets per case study.

In all, there were 14 SDG targets that were relevant for all three cases. Stemming from these, there are 18 UN indicators that the case studies have in common. Of these, three indicators are considered to have high reportability (OLAMUR partners can source the data needed for the indicator) and high influence (OLAMUR partners feel that success in this indicator helps "move the needle" for regional sustainability)

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Table 6: SDG indicators that the relevance-tracing workshops found in common across the three OLAMUR multi-use case studies.

SDG Indicators	
SDG 2 **No Hunger**	2.4.1 Proportion of agricultural area under productive and sustainable agriculture
	2.a.1 The agriculture orientation index for government expenditures
	2.a.2 Total official flows (official development assistance plus other official flows) to the agriculture sector
SDG 4 **Quality Education**	4.4.1 Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill
	4.7.1 Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (*a*) national education policies; (*b*) curricula; (*c*) teacher education; and (*d*) student assessment
SDG 6 **Clean Water and sanitation**	6.3.1 Proportion of domestic and industrial wastewater flows safely treated
	6.3.2 Proportion of bodies of water with good ambient water quality
SDG 8 **Decent work and economic growth**	8.3.1 Proportion of informal employment in total employment, by sector and sex
SDG 9 **Industry, innovation and infrastructure**	9.4.1 CO2 emission per unit of value added
	9.5.1 Research and development expenditure as a proportion of GDP
	9.5.2 Researchers (in full-time equivalent) per million inhabitants
SDG 12 **Responsible production and consumption**	12.2.1 Material footprint, material footprint per capita, and material footprint per GDP
	12.2.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP
	12.6.1 Number of companies publishing sustainability reports
SDG 14 **Life under water**	14.1.1 (a) Index of coastal eutrophication; and (b) plastic debris density
	14.2.1 Number of countries using ecosystem-based approaches to managing marine areas
	14.a.1 Proportion of total research budget allocated to research in the field of marine technology
SDG 17	17.6.1 Fixed broadband subscriptions per 100 inhabitants, by speed[5]

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Partnerships with the goals	

4.6. Report of relevant indicators

We compiled and then mapped the relevant indicators according to the reportability and influence according to the applicable quadrant (see Figure 7). Of particular interest are the indicators that are in the quadrant "high influence/high reportability", as these have existing relevant data that is collected and the ability to "move the needle" for sustainability at a local, regional or national level. Here, Denmark had the most indicators (n=22), followed by Estonia (n=19) and Germany (n=12).

Table 7:Summary of SDG indicators over the three case study areas in OLAMUR

Data indicate the number of relevant SDG indicators

OLAMUR Case Study	High Influence/ High Reportability	Low Influence/ High Reportability	Low Influence/ Low Reportability	High Influence/Low Reportability	Sum of relevant indicators
Case Study A: Germany	12	17	7	3	39
Case Study B: Denmark	22	28	13	0	63
Case Study C: Estonia	19	31	6	3	59

4.7. General observations of the Method

4.7.1. Structural Critiques of SDG Frameworks: Outdated and Inconsistent Definitions

Participants highlighted ambiguities in terminology, such as whether "terrestrial" includes the seafloor, which reduce clarity. They called for an explicit separation of marine and freshwater systems to avoid redundancy. SDG 14 ("Life Below Water") was criticized for focusing on prohibitions, like ending overfishing, rather than proactive measures to support food security, safety, and employment in fisheries. There is difficulty in making indicators influenceable at the local or regional level, as they often have a national focus. This necessitates identifying additional indicators or metrics for many targets that are relevant but not reportable within the scope of this project, such as those that measure the number of countries achieving certain goals. Workshop participants emphasized the necessity of developing scalable SDG targets and indicators, highlighting that corporate sustainability is imperative for system change. Professor Karen from Norway is working on the localization of targets through the concept of social fractals. The SDG targets are often clumsily written, which poses challenges. In some cases, indicators may seem obviously compliant in Europe due to existing laws, such as those governing official and legal employment versus informal employment, and gender equality. However, since SDGs and indicators are drawn up from a global perspective, it remains

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important to report on these aspects. Another challenge is maintaining distance from the dialogue as a moderator to ensure objectivity.

4.7.2. Omissions in Scope

Aquaculture is notably absent from SDG 14's targets, creating inconsistencies in addressing sustainable food production. For example, SDG Target 2.4 and 2.a have been interpreted to include aquaculture:

2.4.1: Proportion of agriculture/aquaculture area under productive and sustainable agriculture/aquaculture.

2.a.1: The agriculture/aquaculture orientation index for government expenditures.

2.a.2: Total official flows (official development assistance plus other official flows) to the agriculture/aquaculture sectors.

Broader food-system linkages, such as nutrition and economic resilience, are insufficiently integrated into SDG indicators, despite their relevance to Goals 2 ("Zero Hunger") and 8 ("Decent Work").

4.7.3. Indicator Gaps and Recommendations

Participants emphasized the necessity of developing indicators that measure supply-chain transparency, public access to sustainability data, and context-specific communication to counter misinformation, such as narratives from Netflix's Seaspiracy. Enhancing Ocean literacy and providing fact-based public education are critical to changing perceptions of aquaculture and fisheries. Current SDG indicators are insufficient in capturing holistic metrics for multi-use marine systems, circular economy practices, or resilience to climate change. There is a call to shift from compliance-driven reporting to actionable, systemic change, such as integrating fisheries into climate adaptation strategies. Systemic recommendations include embedding food-system sustainability and fisheries management into educational curricula to foster interdisciplinary understanding. Additionally, stakeholder collaboration should be diversified beyond policymakers to include fishers, aquaculture producers, and consumers, ensuring that solutions are locally relevant. Future revisions of SDG targets should reflect technological advancements, such as precision fishing gear, and address emerging sectors like seaweed cultivation, which faces challenges in scaling production and competing on price.

4.7.4. Emerging Challenges and Innovations

Seaweed production, while touted as a sustainable alternative, faces current limitations including inconsistent quality, insufficient production volumes, and competition with cheaper imports, such as those from China. A focus on high-value niches, like bioactive compounds, is proposed. Participants recommended repeating the SDG relevance-tracing process periodically to track progress in policy alignment, public perception, and technological adoption.

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4.8. Synergy with OLAMUR WP2: Micro-siting models

In the OLAMUR project meeting on March 20, 2025 in Kuresaare, Estonia, WP2 and WP7 met to discuss the compatibility of the results from the SDG workshops for the case studies.

We agreed that the data from the SDG workshops are most relevant at the regional level, and can give relative indications on how different multi-use scenarios help fulfill SDG targets in the BANOS area, for example.

Table 8: A sample matrix showing how different metrics from the micro-siting tool in WP2.

Input metrics	**Cost**	**Yield**	**Ecological impact**	**CO2**	…
Scenario 1	X	X		X	
Scenario 2		X			
Scenario 3	X				
Scenario …					

Table 9: A sample matrix showing how different metrics from the micro-siting tool in WP2 could include SDG indicators that are translated to a local level.

Input metrics	**2.4.1 Proportion of licensable aquacultural area under productive and sustainable aquaculture**	**9.4.1 CO2 emission per unit of value added**	**14.1.1 (a) Index of coastal eutrophication; and (b) plastic debris density**	**12.2.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP**	…
Scenario 1	X	X		X	
Scenario 2		X			
Scenario 3	X				
Scenario …					

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4.9. Connection to other EU Misson Ocean work

The BlueMissionBANOS 3rd Mission Arena in Amsterdam in 2024 highlighted persistent challenges in aligning Sustainable Development Goal (SDG) frameworks with regional marine initiatives. A key issue centers on SDG indicators' national-level focus, which often lacks scalability to business-level operations, particularly in sectors like offshore wind farms (OWF) and multi-use marine projects. While standardized indicators like informal employment rates and gender equity remain essential for global comparability, their perceived "obvious" compliance in European contexts creates reporting redundancies without local relevance. Participants emphasized the need for business-specific metrics that better reflect operational realities, such as supply chain circularity or site-specific biodiversity impacts.

These observations corroborate the identified structural gaps in SDG relevance-tracing methods for multi-use marine projects. Defining scope boundaries for "influenceable" and "reportable" indicators proved contentious, with Quadrant 4 (high influence/low reportability) remaining empty due to data collection constraints, while Quadrant 3 (low influence/low reportability) contained numerous non-actionable metrics. Stakeholders noted that rigorous sustainability reporting could counteract local apathy toward projects like OWFs by transparently demonstrating environmental and social co-benefits.

Multi-use marine initiatives face implementation hurdles in three areas:

1. **Governance**: Uncertainty persists about responsibility allocation for indicator monitoring between public institutions, private operators, and community groups

2. **Methodology**: Need for hybrid frameworks combining Gold Standard's SDG Impact Tools with localized metrics for algal bioremediation efficiency or habitat restoration rates

3. **Communication**: Developing compelling narratives that connect technical compliance data (e.g., nitrogen capture percentages) with community priorities like job creation.

The discussions underscored that advancing the EU Mission Ocean objectives requires bridging the gap between global SDG architectures and hyperlocal operational realities, particularly through adaptive monitoring systems that accommodate emerging blue economy sectors. Proposed solutions include modular reporting templates that layer core SDG indicators with context-specific performance metrics, enabled by digital platforms for real-time data aggregation.

5. Conclusions

The OLAMUR project employs an innovative methodology centered on capacity building to establish a sustainable and economically viable model for marine resource utilization, thereby contributing significantly to the global sustainability agenda. Research and innovation within this Mission Ocean Lighthouse project are concentrated at co-located low-trophic aquaculture

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and wind farm demonstration sites in Denmark and Germany, as well as an integrated multi-trophic site in Estonia.

Task 7.1 on Relevance-tracing has prepared partners at these demonstration sites for sustainable area planning through the provision of a comprehensive understanding of the 169 Sustainable Development Goal (SDG) targets, the development of practical SDG applications within multi-use marine sites, and the empowerment of stakeholders to address the EU Taxonomy and Corporate Sustainability Reporting Directive.

The three case study workshops provided a significant opportunity to convene an extended peer community for collaborative exploration of the breadth and depth of sustainability across the cases. This work has been instrumental in understanding the social and economic aspects of sustainability in relation to food production, renewable energy production, and biodiversity.

European citizens must attain an understanding of sustainability that extends beyond technology, encompassing a holistic perspective of the various, interrelated components. Feedback from workshop participants across all three workshops indicates that the SDG Relevance-Tracing method has resulted in a more complete and broader understanding of the role of multi-use sites for local and regional communities within their respective geographic, economic, and social contexts. This is attributable to the comprehensive nature of the SDGs, which encompass areas often overlooked by engineers or aquaculture farmers. The team-building fostered by the non-digital workshop environment has enhanced cross-project communication and strengthened a shared understanding of systems and holistic sustainability among OLAMUR partners.

It is anticipated that future work will further benefit from these workshops, particularly in the refinement of quantitative indicators with new data generated from each demonstration site within the upcoming year.

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