Aquabalance
Balancing economic, environmental, and social sustainability in the European aquaculture industry

WP4 – Policy mix for sustainable aquaculture industry

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Abbreviations and acronyms

Abbreviation or acronym used in this document	Explanation
EU	European Union
UN	United Nations
WP	Work Package

Executive Summary

This report presents work completed under Deliverable 13 of Work Package 4.

This is a summary report of the final deliverable.

The report provides a concise framework for policy mixes that guide industrial restructuring while balancing economic competitiveness, environmental sustainability, and social resilience. The framework draws on insights from preliminary work in Work Packages 1-3, a document review, and observations from a policy lab.

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1 Introduction

With global seafood demand rising and wild fisheries at their limits, sustainable aquaculture has become essential to food security, economic growth, and climate mitigation. As the fastest-growing and one of the most resource-efficient animal-protein sectors, with the lowest greenhouse-gas footprint, aquaculture has shown resilience and adaptability across seven decades of continuous expansion (World Bank Group, 2025). Yet despite this progress, the sector now faces mounting sustainability challenges.

Transforming this sector to reconcile economic performance, ecosystem integrity and social welfare is a complex, long-term policy challenge for which no single blueprint exists. Ongoing debates over regulation underscore the need for careful policy design (Sjøtun et al., 2022). Consequently, recent literature emphasises policy experimentation, coherent policy mixes, and open-ended governance that prioritise testing, learning, coordination and geographical sensitivity (Wanzenböck & Frenken, 2020). Advancing sustainable aquaculture depends on strategically coordinated instruments deployed across policy domains, spatial scales and governance levels.

Against this backdrop, Work Package (WP) 4 'Policy mix for sustainable aquaculture industry', examines how regulatory regimes can be designed to support sustainability goals while remaining aligned with related policy domains such as industrial, regional and fiscal policies. The WP emphasises that an effective policy mix should (i) mobilise resources for innovative aquaculture production, (ii) nurture new markets, and (iii) coordinate multi-level governance.

The WP's assumption 'balancing economic, environmental, and social sustainability in the European aquaculture industry requires development and implementation of new policy instruments that nurture new markets, mobilise resources for innovative aquaculture production, promote policy experimentation and coordinate multi-level governance' will be assessed through its defined objectives and tasks.

Objectives:

- Establish a lab for policy experimentation where a broad group of stakeholders (policymakers, industry organizations, public service providers, regional and national authorities, and civil society representatives) will be invited to explore and discuss approaches to the design of a regulatory regime for sustainable aquaculture.
- Develop pan-European and regional policy recommendations.
- Communicate these recommendations to the relevant stakeholders in a series of workshops.
- Establish a policy roadmap.

1.1 Purpose of the document

The purpose of this report is to develop a framework for policy mixes that can facilitate industrial restructuring while harmonizing economic, environmental and social sustainability objectives. The report builds on preliminary insights and policy lessons derived from WPs1-3, as well as observations from a policy lab. It also reviews key aquaculture policy documents from the European Union (EU) and from the project consortium countries to clarify the broader policy landscape.

Aligned with WP4 Objective-1, 'Establish a lab for policy experimentation' (*see* Table 1), this work contributes to Deliverable 13 of the project: the 'Policy mix report'. The policy mix report proposes a framework positioning market nurturing, resource reconfiguration, and resilience

building as complementary levers within a coherent policy mix collectively supporting a balanced and sustainable transition.

Table 1: Objective-1 and task 4.1

Objective		Task
1	Establish a lab for policy experimentation	**Task 4.1: Lab for policy experimentation** Input: Implications and lessons for policy from WPs 1-3
		Output: • Report/inventory of the status-quo of the policy mix for sustainable aquaculture in Europe across multiple domains, scales and governance levels; report that outlines the general design principles of / framework for policy mixes conducive for policy geared to industrial restructuring that balances economic, environmental and social sustainability.

1.2 Intended readership

This document is intended for public readership and constitutes Deliverable 13 of WP 4.

2 Overview of the sector

Aquaculture is essential to the food security strategies of both the EU and Norway, as policymakers seek to reduce the carbon footprint of protein production and promote a sustainable blue economy. Despite being one of the fastest-growing food production sectors globally, EU aquaculture remains relatively small producing only 1.1 million tonnes of farmed fish in 2022, which accounts for less than 1% of global production (Aranda et al., 2024). At the same time, the EU remains heavily dependent on foreign supply. More than 60% of seafood consumed in the region is imported, underscoring the need to expand domestic aquaculture capacity and resilience (European Court of Auditors, 2023). The EU's strategic frameworks emphasise aquaculture as a sector with significant potential, prioritising both sustainable growth and long-term sectoral development.

In contrast, Norway produced 1.6 million tonnes of aquaculture in 2022, exceeding the EU's output and reinforcing its global leadership, particularly in salmon farming (Aquafeed, 2024; Eurofish, 2023; Global Salmon Initiative, 2025). Norway is therefore a major seafood exporter, but its aquaculture industry is now confronting mounting sustainability and governance challenges. Recent policy reforms have shifted the sector from a phase of rapid expansion to a more regulated, performance-oriented model that emphasises risk management, value sharing, sustainability and transparency (EY, 2025). Measures such as 'Development Licenses' and the 'Traffic-Light System' have encouraged innovation but increased scale-up costs and constrained growth in pressured areas, while in 2023 'Resource-rent Tax' has driven corporate restructuring and short-term investment uncertainty (EY, 2025).

Overall, both the EU and Norway face a common imperative: to foster innovation that supports environmental stewardship, social returns and economic viability. Achieving this will require targeted policy instruments and investments that reduce import dependence in the EU, address sustainability pressures in Norway, and create a clear long-term direction for the sector's sustainable development (Aquafeed, 2024; European Court of Auditors, 2023).

3 Methodological approach

This policy mix report draws data from three primary sources: insights and lessons emerging from WPs 1-3, observations gathered during a policy lab (WP 4), a review of key policy

documents (interchangeably used in this document with policy instruments) from the EU and the project consortium's partner countries. Although preliminary, the ongoing inputs from WPs 1-3 provide early indications of sustainability challenges and policy needs, which are complemented by reflections from a policy lab. To examine the existing policy landscape, we analysed key EU-level and national aquaculture related policy documents by reviewing their stated objectives and assessing the directionality of their sustainability ambitions. The methodological approach triangulates these qualitative insights to strengthen the analysis. Drawing on Jakobsen et al. (2021) and integrating an emphasis on social sustainability, we developed a framework intended to support a balanced transition in the EU aquaculture sector. A draft version of the framework was shared with the project group for feedback and refinement. A key limitation is that the findings from WPs 1-3 are still evolving: however, their preliminary insights offer inputs to the policy mix framework in this report. This will be further refined and strengthened as the WPs mature.

4 Approaching policy for sustainability

AQUABALANCE underscores that sustainability transitions require more than the mere presence of individual policy instruments. They call for increased policy experimentation, better policy mixes, and an open-ended perspective that prioritizes testing, learning, coordination, and geographical sensitivity (Wanzenböck & Frenken, 2020). Achieving these goals demand a systematic, integrated, and context-sensitive approach to policy design and implementation. This need motivates a 'policy lab', conceived not as a physical space or permanent team, but as a focused activity: an engagement process specifically designed to facilitate the uptake of research evidence into policy and practice (Hinrichs-Krapels et al., 2020). To bring evidence closer to policymaking, the WP runs policy labs to co-design a regulatory regime for sustainable aquaculture in Europe. The labs convene diverse stakeholders (policymakers, industry organizations, researcher, public service providers, regional and national authorities, and civil society representatives) and will combine plenary and break-out sessions to (i) explore key questions, (ii) prioritise ideas, and (iii) reach consensus.

In EU and its regions, a diverse array of strategies and instruments have been developed to guide countries towards sustainability within the aquaculture sector. These instruments encompass environmental regulation, economic incentives, social equity frameworks, and innovation-driven strategies. However, their existence alone does not ensure effective sustainable outcomes. The core challenge lies in achieving integration, coherence, and adaptability within broader governance frameworks.

Sustainability is inherently context-dependent, interpreted differently across geographical, institutional, and sectoral settings. For the purpose of WP 4, we adopt the United Nation's (UN) definition of sustainability, which encompasses environmental, social, and economic dimensions (Jakobsen & Fløysand, 2025; United Nations, 2015). Achieving a balance among these dimensions of sustainability requires more than isolated policy actions; it demands a systemic and coordinated policy approach with a mix of policies.

The concept of 'policy mix' is central to AQUABALANCE. It refers to the strategic combination of regulatory, financial, and voluntary instruments designed to achieve sustainability objectives (Rogge & Reichardt, 2016). A policy mix often constitutes the most effective approach for addressing the multidimensional challenges of sustainability (Di Santo et al., 2024). As the literature emphasizes, the effectiveness of policy mixes depends not only on the selection of instruments but also on their internal dynamics - how instruments interact, complement, or potentially contradict one another is crucial to success (Flanagan et al., 2011; Kivimaa & Kern, 2016; Rogge & Reichardt, 2016). In resource-based industries such as

aquaculture, transitioning towards sustainability requires the deliberate orchestration of policy instruments that are both mutually reinforcing and contextually appropriate.

5 Implications and lessons for policy from WPs

The primary inputs for Task 4.1: 'Lab for policy experimentation' are derived from the implications and lessons for policy from WPs 1-3. These WPs are at different stages of progress, and their outputs are still preliminary. The contributions presented below therefore draw on these preliminary works and are supplemented by observations from a policy lab.

5.1 Work Package 1

WP 1 identifies the main drivers and challenges shaping sustainable aquaculture in Europe. Using a new stakeholder-based dataset from interviews with aquaculture firms and local stakeholders including politicians, authorities and civil society representatives, it documents emerging trade-offs between economic viability, environmental impact and social legitimacy. These findings will be presented through qualitative case studies.

5.2 Work Package 2

WP 2 is investigating ongoing technological and industrial transformations in the aquaculture sector, assessing how different technologies and supply-chain configurations are shaping sustainability and growth opportunities. It is mapping key European technology and service providers, analysing socio-technical configurations of farming and feed systems, and evaluating regional variations in the upscaling potential of emerging aquaculture technologies.

5.3 Work Package 3

WP 3 analyses consumer preferences for aquaculture products across socio-demographic groups, regions, production systems, and industry segments. It examines how sustainability information shapes consumer choices and public attitudes toward environmental and social impacts of aquaculture.

5.4 Work Package 4

A policy lab was conducted on February 19, 2026, in Bergen, Norway titled 'How can we build a more sustainable food system in Norway?' The symposium brought together participants from the Norwegian seafood industry and researchers from different Norwegian institutions working on aquaculture to discuss future foods and pathways toward a more sustainable food system.

6 Policies and directionality

To support our policy framework, we also examined key aquaculture-related policy documents available online. We define policy instruments as the set of strategic interventions and frameworks, regulatory measures, funding and incentive mechanisms, legislative mandates, and complementary tools intended to translate aquaculture governance goals into concrete, enforceable, and implementable actions. The focus has been to examine a selection of key policy instruments of the project consortium. The instruments presented in this report are illustrative rather than exhaustive. They do not represent all the policy instruments in use but are few examples to highlight their focus and directionality to help understand the context and existing governance landscape.

The examination of these policy document shows that, although EU and Norway formally aim to balance economic, environmental and social objectives, the policy documents examined within the project consortium largely do not address all the three sustainability dimensions comprehensively. Instead, most current policy documents exhibit directional sustainability priorities.

6.1 Policy approaches at the EU level

The EU's policy landscape is shaped by the broader frameworks of 'Common Fisheries Policy', the 'Strategic Guidelines for Sustainable Aquaculture 2021-2030', and larger initiatives such as the 'European Green Deal' and the 'Farm to Fork Strategy'. The EU's approach to aquaculture is guided by a comprehensive multidimensional policy framework that integrates environmental sustainability, economic viability and social responsibility. The policy instruments include a variety of regulatory, financial, and strategic tools aimed at promoting sustainable aquaculture practices and development of the sector. At its core is the Common Fisheries Policy which provides the foundational legal framework for managing EU fisheries and aquaculture. The Common Fisheries Policy aims to ensure that aquaculture activities are sustainable on a long-term basis (European Parliament, 2025).

Building upon this foundation, the Strategic Guidelines for Sustainable Aquaculture offer a roadmap for enhancing the sector's performance and resilience. These guidelines focus on four key pillars: building competitiveness and resilience, participating in the green transition, ensuring social acceptance and consumer information, and increasing innovation and knowledge (European Commission, 2021). They encourage Member States to tailor national strategies that reflect local conditions while aligning with EU-wide objectives (Altmayer, 2024).

Complementing these efforts, the European Green Deal serves as the EU's roadmap to climate neutrality by 2050. Within the aquaculture sector, this includes initiatives to decarbonize operations, promote algae cultivation for bioremediation and alternative protein sources, and enhancing biodiversity while reducing environmental pollution. As part of the Green Deal, the Farm to Fork Strategy aims to transform food systems by promoting organic aquaculture, reducing dependence on wild fish for feed, improving traceability, and advancing circular economy principles (Altmayer, 2024). The 'European Maritime, Fisheries and Aquaculture Fund (EMFAF)' 2021-2027 provides support for developing innovative projects to ensure that aquatic and maritime resources are used sustainably.

Individually and collectively, these policies and strategies reflect multidimensionality or EU's holistic vision for aquaculture – one that balances economic development with ecological integrity and social equity. However, the successful realization of this vision is not solely on the EU-level frameworks but also critically hinges on how these strategies are interpreted and implemented at the national and regional levels.

6.2 Policy approaches at the national level

The preliminary inputs from other WPs indicate that aquaculture operates within diverse environmental, regulatory, and socio-economic contexts, each of which presents its own distinct challenges and priorities. These variations shape how policies are interpreted, implemented and received, and they affect policy feasibility and impact. Consequently, a one-size-fits-all approach is insufficient. Implementation must be flexible and context-sensitive, allowing tailored solutions responsive to local conditions and emerging challenges. This requires coordinated action among EU institutions, national governments, regional authorities, and industry stakeholders. By embracing context-sensitive and adaptive approach,

the EU frameworks can better translate its aquaculture vision into tangible, equitable, and sustainable outcomes across diverse Member States and regions.

Examining the policy landscape, we also analysed national aquaculture related policy documents by reviewing their stated objectives and assessing the directionality of their sustainability ambitions. Drawing inspiration from Jakobsen and Fløysand (2025) to categorize sustainability directionality, we tabulated the policies of Denmark, Ireland, Italy, and Norway (*see* Tables 2,3,4,5).

Table 2: Policy instruments in Denmark

Policy instruments	Purpose	Sustainability
Order No. 1489 on the establishment and operation of aquaculture farms (2017)	Aims to regulate the establishment and operation of aquaculture farms in Denmark through a mandatory authorization system and related environment and reporting requirements. Order No. 1489 on the establishment and operation of aquaculture farms.	Environmental sustainability **(+)**
The Aquaculture Regulation (Havbrugsbekendtgørelsen) (2016)	Aims to regulate the conditions under which marine fish farms (havbruk) may be established and operated in Denmark, ensuring they function only with official authorization, meet environmental requirements such as limits on nitrogen discharge, comply with safety, marking and reporting obligations, and remain subject to monitoring, restrictions, or revocation if rules are violated. Havbrugsbekendtgørelsen	Environmental sustainability **(+)**
Fisheries Act (2019)	Aims to regulate the management and conservation of fisheries, aquaculture, and related activities to ensure sustainable use, protection, and restoration of natural aquatic resources. Fisheries Act. | UNEP Law and Environment Assistance Platform	Environmental sustainability **(+)**
Strategi for Dansk Akvakultur 2021 – 2027	Aims to guide the development of Danish aquaculture towards a future where climate, environment, animal welfare, and biodiversity are central, contributing to the green transition of Danish food production and supporting national climate and water-management goals, including a 70% reduction in greenhouse gas emissions by 2030. Dansk-Akvakulturs-strategi-2021-2027.pdf	Environmental sustainability **(+)**
Strategy for Danish Aquaculture 2021-2027 (Strategi for en Bæredygtig Akvakultursektor 2021-2027)	Aims to align Danish aquaculture with the EU's Strategic Guidelines by promoting resilience, competitiveness, green transition, social acceptance, and innovation, while supporting the objectives of the European Green Deal and the Farm to Fork strategy through sustainable and environmentally responsible production. Brev	Economic sustainability **(+)** Environmental sustainability **(+)** Social sustainability **(+)**
The Fresh Water Aquaculture Regulation (Dambrugsbekendtgørelsen)	Aims to establish a results-based management system that encourages freshwater fish farms to use Best Available Techniques (BAT) and allows production growth without increasing pollution of the aquatic environment. 1 Dambrugsbekendtgørelsen	Economic sustainability **(+)** Environmental sustainability **(+)**

Agreement on the future of fisheries is in place (Aftale om fremtidens fiskeri er på plads) (2025)	Aims to secure a stable, competitive, and environmentally sustainable future for Danish fisheries through economic support, green transition initiatives, and stronger protection of marine. Aftale om fremtidens fiskeri er på plads - Ministeriet for Fødevarer, Landbrug og Fiskeri	Economic sustainability **(+)** Environmental sustainability **(+)**

Table 3: Policy instruments in Ireland

Policy instruments	Purpose	Sustainability
Fisheries (Amendment) Act, 1997 No.23 (1998)	Aims to amend and extend fisheries legislation by prohibiting aquaculture activities without a license, establishing procedures for granting, renewing, amending and revoking such licenses, enabling appeals against licensing decisions, and addressing related purposes. Fisheries (Amendment) Act, 1997	Economic sustainability **(+)** Environmental sustainability **(+)**
Aquaculture (Licence Application) Regulations (1998)	Aims to establish procedures for submitting, reviewing, renewing, and consulting on applications for aquaculture licenses and trial licenses under the Fisheries (Amendment) Act, 1997, including requirements for public notice, public consultation, and environmental impact statements, as well as provisions for cross-border environmental consultation with other EU Member States where significant environmental effects may rise. Aquaculture (Licence Application) Regulations, 1998 (S.I. No. 236 of 1998).	Economic sustainability **(+)** Environmental sustainability **(+)** Social sustainability **(+)**
Planning and Development Act (2000)	Aims to revise and consolidate planning and development law by repealing and re-enacting the Local Government (Planning and Development) Acts 1963-1999 with amendments; to promote planning and sustainable development, including the provision of housing; to regulate the licensing of events and the control of funfairs; to amend related environmental, roads, and waste management legislation; and to provide for connected matters. pdf	Economic sustainability **(+)** Environmental sustainability **(+)** Social sustainability **(+)**
Harnessing Our Ocean Wealth – An Integrated Marine Plan for Ireland (2012)	Aims to promote sustainable development by fostering a strong maritime economy, ensuring healthy ecosystems, and strengthening public engagement with Ireland's maritime heritage and opportunities. untitled	Social sustainability **(+)** Economic sustainability **(+)** Environmental sustainability **(+)**
Marine Planning Policy Statement (2020)	Aims to describe Ireland's current marine planning system, outline a vision for its future development, set out the Government's overarching policies and principles for marine planning bodies. Including expectations for public engagement, transparency, governance, environmental assessment, climate action and social and economic benefit. MARINE PLANNING POLICY STATEMENT	Social sustainability **(+)** Economic sustainability **(+)** Environmental sustainability **(+)**
Maritime Area Planning Act – (MAPA) (2021)	Aims to regulate the maritime area through a national planning framework, introduce long-term consents and short-term licenses for maritime	Economic sustainability **(+)**

	activities, establish the Maritime Area Regulatory Authority to oversee and enforce these systems, amend the Planning and Development Act 2000 accordingly, and provide for related matters. Maritime Area Planning Act 2021	
National Marine Planning Framework – NMPF (2021)	Aims to bring together ocean users to make coordinated, sustainable decisions by organising human activities in marine areas to balance ecological, economic, and social goals. national-marine-planning-framework.pdf	Social sustainability **(+)** Economic sustainability **(+)** Environmental sustainability **(+)**
National Strategic Plan for Sustainable Aquaculture Development (2022-2030) NSPSA (2023)	Aims to align updated EU guidance on sustainable aquaculture with national planning, guide investment priorities for Ireland's Seafood Development Programme, and provide a framework that supports strategic, sustainable, and forward-looking development of the Irish aquaculture sector. national-strategic-plan-for-aquaculture-report.pdf	Economic sustainability **(+)** Environmental sustainability **(+)**

Table 4: Policy instruments in Italy

Policy instruments	Purpose	Sustainability
Strategic Aquaculture National Plan 2021-2027 (2023)	Aims to protect biodiversity, strengthen institutional capacity and simplify administrative procedures, ensure sustainable aquaculture development through coordinated spatial planning and improved site potential, and promote competitiveness and a level playing field within the aquaculture market. AAM_MNSP_ITALY_0.pdf Masaf - Fondo Europeo Affari Marittimi Pesca e Acquacoltura (FEAMPA) 2021-2027	Economic sustainability **(+)** Environmental sustainability **(+)**
Decree nr. 228 of May 18th 2001	Legislative Decree No. 228 laying down the guidelines and modernizing the agricultural sector, as per article 7 of Act No. 57 of 5 March 2001. | UNEP Law and Environment Assistance Platform	

Table 5: Policy instruments in Norway

Policy instruments	Purpose	Sustainability
The Aquaculture Act (2005)	Aim to promote the profitability and competitiveness of the aquaculture industry within the framework of sustainable development, and to contribute to value creation along the coast. Layout 1	Economic sustainability (+) Environmental sustainability (+)
Green Licenses (2013)	Aim to enable controlled growth in Norwegian aquaculture by promoting the development and adoption of environmental technologies that reduce-sea-lice levels and escape risks, while allowing production to increase within stricter sustainability requirements. Aquaculture policy: Designing licenses for environmental regulation - ScienceDirect	Environmental sustainability (+)
Development Licenses (2015)	Aim to stimulate technological innovation that addresses aquaculture's land-use constraints and	Environmental sustainability (+)

	environmental impacts by awarding licences exclusively for the development of new green technologies. 8: The role of agency for the shifting balance of economic, environmental, and social sustainability in the history of the Norwegian salmon farming industry in: Sustainable Regional Restructuring	Economic sustainability (+)
The Aquaculture Fund (Havbruksfondet) (2015)	Aim to return aquaculture revenues to coastal municipalities and county authorities by distributing the municipal sector's share of income from industry growth and from the production tax on salmon, trout, and rainbow trout through the Aquaculture Fund, administered by the Norwegian Directorate of Fisheries. Havbruksfondet | Fiskeridirektoratet	Social sustainability (+)
Traffic Light System (2017)	Aim to reduce the environmental impact of salmon aquaculture by regulating production growth through a traffic light system that links allowed biomass levels to the sustainability status of each production zone, measured primarily by the effect of sea lice on wild salmon. Jakobsen and Floysand Chapter8SustaianbleRegionalRestructuring.pdf	Environmental sustainability (+)
Norwegian Aquaculture Strategy-A Sea of opportunities (2021)	Aim to support sustainable growth in the aquaculture industry by ensuring good fish health and welfare, enabling the production of sustainable seafood with a low climate and environmental footprint, delivering healthy and safe seafood that meets nutritional needs and consumer preferences, securing access to competitive markets through robust documentation of food safety, sustainability, and fish welfare, and contributing to profitable jobs, local value chain creation, and societal revenues along the Norwegian coast. An introduction to the Government's new aquaculture strategy - Simonsen Vogt Wiig	Social sustainability (+) Economic sustainability (+) Environmental sustainability (+)
Resource Rent Tax (2023)	Aim to ensure that the general public receives a fair share of the extraordinary profits generated from the exploitation of jointly owned natural resources through the resource rent tax on aquaculture. Resource rent tax on aquaculture - regjeringen.no	Social sustainability (+)
NOU 2023:23 Helhetlig forvaltning av akvakultur for bærekraftig verdiskaping (holistic management of aquaculture for sustainable value creation)	Aim to develop a holistic and sustainable management system for Norwegian aquaculture that maximises long-term value creation by improving environmental performance, strengthening biosecurity and fish welfare, ensuring effective use of coastal areas, simplifying and modernising the licensing framework, and providing stronger incentives for sustainable production and responsible industry growth. NOU 2023: 23 - regjeringen.no	Social sustainability (+) Economic sustainability (+) Environmental sustainability (+)
White Paper No. 24 'The Future of Aquaculture - Sustainable Growth and Food for the World (2025)	Aim to establish a new and more holistic management system for Norwegian aquaculture that strengthens environmental sustainability, improves fish health and welfare, replaces biomass-based regulation with more accurate impact-based tools, introduces economic instruments such as salmon-lice emission quotas and levies, ensures responsible use of coastal	Social sustainability (+) Economic sustainability (+) Environmental sustainability (+)

	areas, and enables sustainable growth and long-term value creation in the aquaculture sector. Meld. St. 24 (2024–2025) - regjeringen.no	

6.3 Sustainability dimensionality

Looking across EU level and national level policies, it becomes evident that many policy instruments at the national level tend to prioritize one or two dimensions of sustainability. Most often economic and environmental while the social dimension receives comparatively less attention. However, as indicated by the preliminary findings from WP 1, sustainability challenges vary significantly across different contexts, requiring approaches that are both comprehensive and adaptable. Therefore, a diverse mix of policy instruments is essential to effectively address challenges across different domains, governance levels and scales. This highlights the need for policy mixes that address all three dimensions of sustainability – economic, environmental, and social in an integrated way. Importantly these mixes must be context-dependent, shaped by local realities while remaining consistent with broader EU-level objectives.

7 Advancing a policy mix approach to sustainability

Synthesizing preliminary insights from the WPs, a policy lab, and the document review, three key observations emerge. First, early findings from the regional hubs, although still preliminary indicate regional variation in sustainability challenges, underscoring the need of a flexible context-sensitive policy approach capable of adapting to differing priorities and constraints. Second, the policy lab highlights the complexity of stakeholder environments and governance structures, indicating the need of experimentation and coordinated action. Third, the document review points to the need for better coordination and a triple-bottom-line optimization approach.

Moreover, as emphasised in Section 4 of this report, achieving sustainability objectives requires a strategic combination of policy instruments. A well-designed policy mix is essential for addressing the multidimensional challenges of sustainability, particularly when pursuing triple-bottom-line optimisation across economic, environmental, and social goals. Revisiting the literature, Jakobsen et al. (2021) argue that achieving sustainability in resource-based industries such as aquaculture requires a balanced and context-sensitive approach that integrates environmental, economic, and social dimensions – an approach central to AQUABALANCE. This underscores the need for a triple-bottom-line optimization policy mix that not only aligns with the sectors ecological goals but also supports economic viability and social equity through coordinated, context-sensitive interventions. Based on this understanding, policy action for sustainable aquaculture can be operationalized through five elements: police experimentation (cross-cutting), market nurturing (economic), resource reconfiguration (environmental), resilience building (social), and policy mix coordination.

7.1 Policy experimentation

The limited multidimensionality of existing policy instruments and the challenge of strengthening even single sustainability dimensions highlights the inherent complexity of achieving sustainable outcomes. Advancing toward a balanced sustainability pathway therefore requires experimentation with new policy approach to test, build consensus and reduce uncertainty. Within a policy framework, policy experimentation plays a vital role. It involves the designing, testing, refinement, and reformulating innovative policy instruments, governance models, and institutional initiatives in real-world settings to address complex sustainability challenges (Jakobsen et al., 2021). This approach allows for adaptive learning through an iterative process, which are essential for dynamic and evolving sectors such as

aquaculture. Policy experimentation is thus not merely the application of new measures, but a pathway for policy innovation.

7.2 Market nurturing

Market nurturing in aquaculture refers to the strategic support of emerging sustainable products, technologies, and practices that face difficulties in competing with established industry norms (Jakobsen et al., 2021). Often, these innovations struggle to gain market traction due to uncertainties about their performance, lack of consumer awareness, absence of industry standards, or underdeveloped supply chains. As a result, markets for such products may be weak or entirely non-existent. These challenges are particularly pronounced in aquaculture, where sustainable alternatives – such as novel feed ingredients, salmon lice control systems, low-impact farming systems, or circular economy models are still in early stages of development. Without targeted support, these innovations risk being overshadowed by conventional practices that benefit from economies of scale and entrenched market practices (Ohia, 2025). To overcome these barriers, market nurturing involves deliberate government and institutional interventions. These may include financial incentives, subsidies, favourable tax regimes, public procurement strategies, and regulatory reforms that lower entry barriers and stimulate demand. Such measures help to reduce risk in sustainable aquaculture investments, encourage innovations, and foster the development of viable markets for environmentally friendly solutions. By enabling emerging technologies and practices to compete and scale, market nurturing directly contributes to the economic sustainability of the aquaculture sector by supporting long-term profitability, job creation, and regional development.

7.3 Resource reconfiguration

Resource reconfiguration in aquaculture involves strategically repurposing and redirecting existing regional assets such as natural resources, skills, technologies, infrastructure and institutions to support the sector's transitions toward environmental sustainability (Jakobsen et al., 2021). This approach emphasises modifying and adapting what already exists to meet evolving sustainability goals. In practice, this means leveraging local expertise, upgrading existing technologies, and reorienting infrastructure to support low-impact and eco-friendly aquaculture practices. Policy support is essential to enable resource reconfiguration. Government and regional authorities must create enabling conditions through targeted investments, capacity building initiatives, and regulatory frameworks that promote environmentally responsible practices while also fostering innovation and growth. This dual focus ensures that aquaculture development is both ecologically sound and economically viable, contributing to long-term sectoral resilience.

7.4 Resilience building

Resilience building in European aquaculture, a resource-based industry facing complex and evolving challenges, refers to the capacity of aquaculture systems, institutions, and communities to adapt to and recover from environmental, economic, and social disruptions. These disruptions may also occur through market fluctuations, development process, and regulatory shifts. Strengthening resilience is essential for ensuring the long-term sustainability of the sector, enabling it to respond effectively to uncertainty while supporting inclusive development and innovation. It involves initiating changes and supporting development pathways that enable the sector to withstand shocks, adapt to changing conditions, and foster inclusive growth. This includes strengthening institutional flexibility, promoting innovation, supporting small-scale producers, and ensuring that communities are actively involved in shaping the future of aquaculture. To ensure social sustainability, policy instruments must be designed with inclusive approaches that reflect the diverse needs of stakeholders – from coastal communities and small-scale farmers to industry actors and regulators.

7.5 Policy coordination

Finally, policy coordination is fundamental to achieving sustainability in aquaculture. The EU aquaculture legislation is complex and fragmented, leading to significant governance challenges. Boyes and Elliott (2014) demonstrate through the concept of 'horrendogram' how international, EU, and national frameworks interact in messy and often contradictory ways. This emphasizes the necessity for a more effective framework that requires improved coordination, simplification, and integration of existing legislation.

Sustainable aquaculture is not driven by a single policy instrument but rather by the effective interaction of multiple policies functioning across different sectors, governance levels, and timeframes. It requires the alignment of regulatory, financial, and informational instruments to ensure coherence and synergy in addressing the environmental, economic, and social sustainability goals (Jakobsen et al., 2021; Rogge & Reichardt, 2016).

In practice, policy coordination entails integrating policies across multiple domains, scales, and governance levels. This includes vertical coordination between national, regional, and local authorities, as well as horizontal coordination among sectors such as fisheries, agriculture, and marine spatial planning. This multi-level and cross-sectoral approach helps avoid policy fragmentation and ensures that sustainability efforts are mutually reinforcing rather than contradictory (Dorado-Rubín et al., 2025).

7.6 Proposed framework for policy mix

Taken together, the elements discussed above and their link to temporal and contextual conditions provide a framework for assessing the balanced sustainability optimization in the resource-based aquaculture industry. Figure 1 illustrates how policy interventions can support a balanced sustainability transition by moving each dimension, economic, environmental, and social and coordinating them along a continuum from weak to strong. The figure shows that achieving a balanced sustainability outcome requires progression from single-dimension improvements to integrated, three-dimensional optimisation. For the economic dimension, market nurturing must evolve from nurturing existing markets toward creating new markets that enable sustainable growth. For the environmental dimension, resource reconfiguration needs to move beyond the reuse of existing resources toward enabling the creation of new and importation of more sustainable resources. For the social dimension, resilience building must progress from strengthening current adaptive capacities to fostering new transformative capacities that support long term social resilience. Policy experimentation plays a cross-cutting role, helping each dimension shift from adaptive existing instruments to improving or introducing innovative policy tools through experimentation that address emerging sustainability needs. Once each of the dimensions has advanced along its respective continuum, coordinated policy mix governance becomes essential, allowing the system to move from isolated, sector specific interventions toward integrated, multidimensional policy initiatives that jointly optimise economic, environmental and social outcomes.

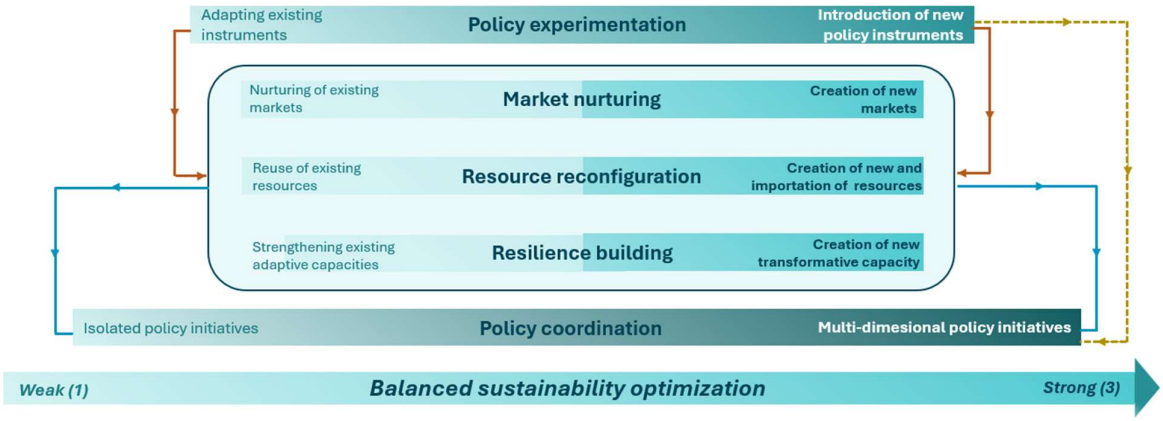


Figure 1: Proposed framework for policy mix (adapted from Jakobsen et.al, 2021 and modified by the authors

8 Conclusions

This report presents the work completed under Deliverable 13 of WP 4. The deliverable develops a concise framework for policy mixes that can guide industrial restructuring while balancing economic competitiveness, environmental sustainability, and social resilience. The proposed policy mix framework is informed by preliminary insights from WPs 1-3, a review of key policy documents, and observations from a policy lab.

Drawing on theoretical perspectives from the literature, the work synthesizes inputs from early indications from WPs 1-3, which, although still preliminary, highlight the importance of a context-sensitive policy approach: and the findings from the document analysis, which underline the need for stronger policy coordination, as many existing policy instruments do not address all three dimensions of sustainability. Based on these combined insights the report proposes a policy mix framework designed to support triple-bottom-line optimisation.

However, the report is subject to important limitations. The inputs particularly from the WPs remains in an early stage of development. As a result, the framework presented here should be considered a provisional structure that will benefit from further empirical grounding as the project advances. Future iterations of the work will be strengthened by more mature WP findings and deeper comparative insight across regional contexts.

Disclosure of AI assisted tools
During the preparation of this report, Microsoft Copilot was used to translate policy documents, particularly their stated objectives into English. In addition, Microsoft Copilot and ChatGPT were used to enhance the language, readability, and clarity of the text.

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Annex 1: The Consortium

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