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Beyond the Pond

A Vision and Roadmap for the Strategic Transformation of the Aquaculture Sector

CROATIA 2020-2030

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Beyond the Pond

A Vision and Roadmap for the Strategic Transformation of the Aquaculture Sector

CROATIA 2020-2030

This report was prepared by a World Bank Group technical team of staff and consultants led by Svetlana Edmeades and comprising Jurica Jug-Dujakovic, Bojan Bajic, Philip Van der Celen, and Jela Bilandzija. The report benefited from advice provided by Randall Brummett and Berengere Prince (peer reviewers), Luka Bacic, Frauke Jungbluth (Manager for the Food and Agriculture Global Practice) and Elisabetta Capannelli (Country Manager for Croatia), World Bank Group. The Team acknowledges the invaluable support provided by the Ministry of Agriculture for the preparation of this report and in particular to Minister Marija Vučković, to State Secretaries Tugomir Majdak and Zdravko Tušek, and to Nikša Tkalec, Ante Mišura, Mario Jurašić and Mislav Banek, among others.

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Abbreviations and Acronyms

AKIS	Agriculture Knowledge and Innovation Systems
CAP	Common Agriculture Policy
CBS	Croatian Bureau of Statistics
CIE	Combined Intensive-Extensive (system)
CMES	Common Monitoring and Evaluation System
CVIS	Central Veterinary Information System
EAFRD	European Agricultural Fund for Rural Development
EIS	European Innovation Scoreboard
EMFF	European Maritime and Fisheries Fund
ERDF	European Regional Development Fund
ESIF	European Structural and Investment Funds
EU	European Union
FLAG	Fisheries Local Action Group
FTE	Full-Time Equivalent
GDP	Gross Domestic Product
GHG	Greenhouse Gas
IMTA	Integrated Multi-Trophic Aquaculture
JRC	Joint Research Centre
MoA	Ministry of Agriculture
MSME	Micro-, Small- and Medium Enterprise
NDS	National Development Strategy
NGA	Next Generation Access
NSPAD	National Strategic Plan for Aquaculture Development
NUTS	Nomenclature of Territorial Units for Statistics
PMEF	Performance Monitoring and Evaluation Framework
RAS	*Recirculating aquaculture system*
RAS	Reimbursable Advisory Service
RDI	Research, Development and Innovation
SDG	Sustainable Development Goal
SO	Strategic Objective
STARS	Strategic Transformation of Agriculture and Rural Space
WB	World Bank

Executive Summary

Agri-food sector stakeholders in Croatia have converged on a vision for the sector "*produce more and high quality and nutritious food at competitive prices, sustainably manage natural resources in a changing climate, and contribute to improved quality of life in rural areas and increased rural employment*". The agri-food sector, including the aquaculture sector, is an important contributor to the economy and life of Croatia, and it is undergoing a process of transformation, where the primary sector is employing fewer people, but value addition and product development are becoming important drivers in this process, and where climate change is challenging the productive potential of many parts of the country and pointing towards the rethinking of the sustainability of public support programs.

The strategic vision for aquaculture is formulated around 4 strategic objectives: 1) *Increase the Productivity and Climate Resilience of Aquaculture Production*; 2) *Strengthen the Competitiveness of the Business Environment and the Aquaculture Sector*; 3) *Renew the Economy and Improve Livelihoods in Rural and Coastal Spaces*, and a cross-cutting objective 4) *Stimulate Innovation across the Aquaculture Sector*. Underpinning each strategic objective are a set of critical needs that identify the changes required to achieve the four strategic policy priorities. To address the critical needs, specific interventions are formulated as a roadmap that links the broad objectives to specific actions.

All strategic objectives point towards improving rural and coastal economies and contribute towards the overall economic development of Croatia. This would be achieved through improving the productivity of aquaculture in a climate-smart and sustainable manner, focusing on strengthening the competitiveness of all productive units, while fostering better linkages between production and markets, generating more and better jobs in the rural and coastal economy along the aquaculture value chain and not only in primary production activities. The clear focus of the strategic vision on innovation is critical for improving the economic development of aquaculture and all its forward and backward linkages with other sectors of the economy.

The strategic vision was formulated using an evidence-based planning process, including economic analysis and stakeholder consultations. As such, it not only provides a reference for the development of rural and coastal areas of Croatia, as based on country priorities, but it also fulfills the strategic processes required of Croatia as a Member State of the European Union. Specifically, it enables the formulation of a National Strategic Plan for Aquaculture Development as well as Croatia's new Operational Program for the European Maritime and Fisheries Fund (EMFF) for 2021-2027. The strategic vision for aquaculture also takes into account the ongoing formulation of a National Development Strategy (NDS). Hence, all activities under the strategic vision will contribute towards the broader development objectives of Croatia. Among them is the integrated territorial development of rural and coastal areas, where natural resources and economic investments intersect and contribute towards modernizing the local economy. This is driven by the need to improve the coordination and complementarity between interventions in rural and coastal areas and accelerate the transition to a smart and green rural economy. This, while adhering to the new directions of the EU under the European Green Deal and Farm to Fork frameworks. Croatia has a large potential to improve the performance of its aquaculture sector and the rural and coastal economy. This strategic vision and roadmap provide the directions and outline the actions to guide this process of transformation and support the country turn its aquaculture sector into an engine of growth.

1. Background

This document outlines a vision and roadmap for the strategic transformation of the aquaculture sector in Croatia for the 2020-2030 period. This document seeks to provide strategic guidance to the Ministry of Agriculture (MoA) (the client) with respect to the design, implementation, monitoring and evaluation of Croatia's post-2020 aquaculture development strategies and plans funded mainly through the national budget as well as the European Union's (EU) European Maritime and Fisheries Fund (EMFF), Structural and Investment Funds (ESIF), and Horizon Europe. Specifically, the document provides a basis for the development of Croatia's future National Strategic Plan for Aquaculture Development (NSPAD) and new Operational Program for the EMFF, which must be prepared by the MoA in line with the programming requirements established for the next EU budget period (2021-2027). The 2020-2030 period covered by the vision and roadmap presented in this document has been defined to encompass both the next EU budget period (2021-2027) as well as the transition years prior to and succeeding the next EU budget period. Importantly, the document lays out a vision and roadmap for the strategic transformation of the aquaculture sector in Croatia that goes beyond the aquaculture farm and considers challenges, opportunities, and actors influencing the broader food sector/system from "farm-to-fork" in Croatia. The food sector/system thus defined includes the key components that make up the aquaculture value chain, including aquaculture production, post-harvest management/handling and processing, aggregation and distribution, markets, and consumer demand, as well as the knowledge and innovation system, rural and coastal infrastructure, and support services that link the different components of the aquaculture value chain.

The document incorporates inputs generated by sector, territorial, national, and EU strategic planning processes currently underway in Croatia. First of all, the document integrates the outcomes of the extensive diagnostic work and stakeholder consultations regarding aquaculture and fisheries sector-specific challenges, drivers, priorities, needs, and potential interventions, which were recently completed by the World Bank under the Strategic Transformation of Agriculture and Rural Space (STARS) Reimbursable Advisory Service (RAS) Project.[1] In addition, the document takes into account the strategic directions and planning framework laid down in the most recent legislative proposals presented by the European Commission

1 Relevant STARS RAS activities and reports produced by The World Bank include (i) *Diagnostic Analysis: Capture Fisheries and Aquaculture*, delivered in July 2019; (ii) *Croatia Stakeholder Consultations and Priority-setting Results: Agriculture, Aquaculture, and Fisheries*, delivered in July 2019; (iii) *Strategic Vision: Post-2020 Critical Needs and Objectives for Aquaculture in Croatia*, delivered in November 2019; (iv) *Stakeholder Survey: Strategic Vision for Aquaculture in Croatia*, organized by the MoA from 4th-15th of December 2019; and (v) *Croatian Aquaculture and Fisheries Market Analysis*, delivered in March 2020.

for the EMFF, the ESIF, and Horizon Europe.[2] For the next programming period, the European Commission also intends to revise the "Strategic Guidelines for the sustainable development of EU aquaculture", which were adopted in 2013. Crucially, the document is aligned with the strategic directions of the "European Green Deal" presented by the European Commission in December 2019. In particular, the document shares the ambition of the "European Green Deal" to transform the European economy for a sustainable future by (i) further reducing greenhouse gas (GHG) emission emanating from bio-based sector and strengthening its capacity to adapt to climate change; (ii) supporting the decarbonization of local energy systems; (iii) mobilizing industry for a clean and circular economy; (iv) leveraging the power of digital and bio-based technologies; and (iv) transforming agri-food systems to become a provider of safe, sustainable, healthy, and high-quality foods; an engine for improved rural livelihoods; and a steward of ecosystems and biodiversity resources in production landscapes. The food system approach adopted in this document is equally aligned with the approach followed by the European Commission in the development (by the Spring of 2020) of a "Farm to Fork" Strategy as part of the Roadmap accompanying the "European Green Deal". Finally, the document incorporates, where relevant and appropriate, complementary strategic planning outputs supported by the World Bank in the framework of the ongoing National Development Strategy (NDS)[3] and Slavonia RAS.[4]

The document identifies the opportunities, objectives, needs, and specific interventions for the strategic transformation of the aquaculture sector in Croatia in the 2020-2030 period. The strategic vision and roadmap presented in this document are focused on leveraging key development opportunities for Croatia's aquaculture sector and establishing a results-based management framework where objectives, needs, and interventions are both explicit and evidence-based. In addition, the results-based management framework establishes clear and logical links between, on one hand, the proposed objectives and needs, and the proposed roadmap of interventions, on the other hand. Importantly, the objectives, needs, and interventions presented in this document were identified on the basis of (i) extensive sector diagnostic work completed by the STARS RAS Team; (ii) a careful mapping of key drivers affecting the performance of the aquaculture sector and key sub-sectors reviewed as part of the aquaculture and fisheries market analysis completed under the STARS RAS; and (iii) a stakeholder- and theory of change-driven priority-setting process.[5] This priority-setting process was complemented by a stakeholder survey organized by the MoA from the 4th to the 15th of December 2019, which targeted stakeholders in key aquaculture sub-sectors.

Structure of the document: Following an overview of the proposed vision for the transformation of the broader agri-food sector in Croatia (Section 2), this document highlights the main development opportunities facing Croatia's aquaculture sector (Section 3). Followed by the strategic objectives and sector needs (Section 4) that must be addressed to achieve the strategic vision and seize the development opportunities. Next, the main lines of action to address the various sector needs are discussed in the form of a proposed roadmap of interventions (Section 5), including how these interventions translate into several key sub-sector-specific measures (Section 6 and Annex I-V). Linkages between the objectives and the needs pre-

2 Relevant legal texts include: (i) European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *Strategic Guidelines for the sustainable development of EU aquaculture*, COM(2013) 229, available at https://scar-europe.org/images/SCAR-Documents/Strategy_EU_aquaculture.pdf; (ii) the European Commission proposal for a Regulation COM (2018)390 on the European Maritime and Fisheries Fund and repealing Regulation (EU) No 508/2014 of the European Parliament and of the Council, available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A390%3AFIN; (iii) European Commission proposal for a Regulation establishing common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund and the European Maritime and Fisheries Fund, and financial rules for those and for the Asylum and Migration Fund, the Internal Security Fund and the Border Management and Visa Instrument COM/2018/375 final – 2018/0196 (COD), available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A375%3AFIN; and (iv) the European Commission proposal for a Regulation establishing Horizon Europe – the Framework Programme for Research and Innovation, laying down its rules for participation and dissemination COM/2018/435 final - 2018/0224(COD), available at https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1540387631519&uri=CELEX%3A52018PC0435

3 The World Bank (2019) *NDS Policy Note - Agriculture, Fisheries, and Food Processing in Croatia's Food & Bio-Economy*, Washington DC, 88pp.

4 Relevant Slavonia RAS reports produced by the World Bank included: (i) *Growth and Jobs in Slavonia, Baranja, and Srijem – Deliverables Report 1.1 Rapid Diagnostic*, delivered in March 2019 (Revised April 2019); (ii) *Growth and Jobs in Slavonia, Baranja, and Srijem – Deliverables Report 1.3.a. Review of ESIF Operational Programs 2014-2020*; and (iii) *Growth and Jobs in Slavonia, Baranja, and Srijem – Deliverables Report 1.2.a. Prioritization Framework for Strategic Projects*, delivered in June 2019.

5 The STARS RAS Report *Using Priority-Setting and Theory of Change Methods for Developing Results-based Food and Bio-Economy Strategies in Croatia - Methodological Guidance Note for Stakeholder Consultations*, which was produced by the World Bank and delivered to the MoA in April 2019, provides a detailed description of the Theory of Change and priority-setting methods used.

sented in this report and the emerging EMFF strategic planning framework are also provided (Section 7). These linkages will be further developed as the ongoing reform of the EMFF is finalized by the EU in the course of 2020. Finally, the document includes a result monitoring framework organized around relevant performance indicators proposed for the future EMFF as well as indicators currently applied in Croatia (Section 8). This framework will be further developed as the ongoing reform of the EMFF and its Common Monitoring and Evaluation System (CMES) is finalized by the EU in the course of 2020 in line with the "Farm to Fork" Strategy.

2. Strategic Vision

The agri-food sector stakeholders in Croatia have defined a shared vision of success that will "produce more and high quality and nutritious food at competitive prices, sustainably manage natural resources in a changing climate, and contribute to improved quality of life in rural areas and increased rural employment." This statement recognizes the importance of addressing natural resource management challenges (and opportunities) in a context of accelerating climate change and consumer demand shifts. It also emphasizes the need to design a growth model for the sector that contributes to balanced territorial development, to nutrition, and social inclusion (including for women producers, female rural workers[6] and young people, who are among the groups with the biggest constraints to enter the labor market).

To realize this shared vision of success, future policies and programs can enable the re-positioning of Croatia's aquaculture sector in domestic, regional and international markets. Considering Croatia's factor endowments, the comparative advantages linked to its geography and proximity to large and diverse EU markets, changing consumer preferences and growing domestic tourism demand, and fast-paced technological developments, future aquaculture sector policies and programs can enable a more market-driven development of aquaculture in Croatia, where improved productivity on-farm, efficiency gains along the value chain and competitiveness of Croatian products drive the transformation of the agri-food system. Public support can enable large producers to materialize on economies of scale, while modernizing their production base and improving their efficiency, while small and medium-scale producers can optimize their production through diversification strategies and innovation. Improving the overall value added of the sector can generate more jobs in rural areas, strengthen rural livelihoods and promote the differentiation of Croatian products in the country and abroad. Croatia's aquaculture sector will seek to offer products in strategic product (fresh & perishable), consumer (convenience & indulgence), and market (circular bio-economy[7]) segments that are perceived by consumers to be of superior quality to those of its competitors even though their prices may be higher, in order to diversify the agri-food sector away from low value-added production. In light of this proposed re-positioning, a shift in sector policies towards increasing efficiency, diversification and product differentiation and finding new ways to valorize aquaculture (by-)products is key to accelerating the structural transformation process of the sector.

Accelerating the structural transformation of Croatia's aquaculture sector in a climate-smart manner will be fundamental to strengthening its competitive position. The high shares of GDP and employment that still depend on the primary sector, the low levels of productivity, the existing rural/coastal-urban income divide, and the persistent link between poverty and primary production, signal that the structural transformation process of Croatia's broader agri-food sector, including the aquaculture sector, is not yet complete. Added to this are the more frequent extreme weather events that constrain sector performance and significantly increase the risk to producers. This incomplete structural transformation constrains the competitive position of Croatia's aquaculture sector and limits its potential contribution to improved growth, employment

6 Two in every five (40%) regular agricultural workers in Croatia are female, a slightly higher proportion than the corresponding EU-27 average (37.5%) (Eurostat, 2018).

7 The EU defines bio-economy as the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy.

and income levels in rural and coastal areas. Accordingly, future aquaculture policy and program priorities should be geared toward breaking down the existing link between poverty, vulnerability, and primary production activities in Croatia by addressing structural constraints to transforming Croatia's aquaculture sector and achieving higher growth, employment and incomes in an inclusive manner. Considering the threats – and some opportunities – posed by accelerating climate change impacts and risks, climate mitigation and adaptation co-benefits will have to be fully integrated in these efforts.

3. Opportunities

Important aquaculture development opportunities are embedded in the macro trends and issues that are shaping the future of Croatia's aquaculture sector. The overall performance of Croatia's aquaculture sector is affected by a number of changing socio-economic, market, environmental, policy, and technological conditions. While these changes may pose a number of challenges to realizing the strategic vision for Croatia's agri-food sector, including the aquaculture sector, they also bring important development opportunities, which must be leveraged under future sector strategies and plans to advance the shared vision of success:

i. **Growth and Employment:** Croatia's integration in the EU and global market during the last two decades has opened new growth opportunities for domestic aquaculture producers and processors. Croatia's mariculture sub-sector has managed to seize upon these opportunities and increase production dramatically (20-fold) over the past twenty-five years. However, this positive growth performance has yet to be replicated for freshwater aquaculture species as their production has almost been cut in half over the same period. Improving the linkages between aquaculture production and processing constitutes another important opportunity area for Croatia. In general, the agri-food processing industry in Croatia has demonstrated a strong potential to generate economy-wide effects on value addition and employment creation.[8]

ii. **Trade and Consumption:** Overall, the net balance of trade of fish (both capture and farmed) in Croatia is positive and has been so for many years. The trade surplus is mainly driven by exports of tuna (to Japan) and white fish (sea bass and sea bream to Italy). Most of the other fish farmed in Croatia, in particular shellfish (mussels, oysters) and freshwater fish (carp, trout), is consumed domestically. However, production volumes of these species are too small to satisfy local demand, with imports filling the gap. The growing tourism sector and low per capita fish consumption[9] in Croatia (compared to other EU member states) point to important growth potentials in the domestic market for local aquaculture producers. On the other hand, growth opportunities in the EU market are increasingly driven by consumer demands shifting towards high value food products. This includes growing consumption of

8 The expanded value added of food processing accounts for 8.5% of total output in the economy, while that of agriculture accounts for 6.5% (in 2014). Meanwhile, the employment multiplier of food processing (2.61) is relatively high, but that of primary agriculture is low (1.43).

9 In 2016, yearly per capita consumption (including away-from-home) of fishery and aquaculture products in Croatia was 17.1 kg/capita/year compared to an EU-18 average of 24.3 kg/capita/year and significantly higher consumption levels in Spain (45.7 kg/capita/year), France (32.9 kg/capita/year), and Italy (31.1 kg/capita/year). Source: European Market Observatory for Fisheries and Aquaculture Products (EUMOFA), The EU Fish Market – 2018 Edition, Available at https://www.eumofa.eu/documents/20178/132648/EN_The+EU+fish+market+2018.pdf

fishery and aquaculture products, which provide consumers an efficient (compared to livestock products) and healthy source of animal protein.[10]

iii. **Climate Change and Environmental Sustainability:** It is unclear how climate change is most likely to affect aquaculture in Croatia. Nevertheless, climate change creates an important source of risk and potential vulnerability for the sector. This includes reduced precipitation and its potential for affecting freshwater availability in selected locations, increasing warming trends (especially to the extent they influence water temperature), and the potential for adverse climate events such as droughts and floods. On the other hand, Croatia has a significant opportunity to reshape current productivity levels in the aquaculture sector with climate-smart processes, access to green technologies, and scaled public-private partnerships to ensure that sector productivity is efficient, diversified, and cost-effective.

iv. **Regional and Territorial Development:** Even if the development of well-integrated aquaculture value chains could help create new and more rewarding aquaculture jobs in rural and coastal areas in Croatia, complementary employment and income opportunities could be generated by leveraging linkages between the aquaculture sector and other sectors in rural and coastal areas. In this regard, territorial development initiatives that strengthen the linkages between aquaculture, gastronomy, and tourism sectors and actors are particularly relevant given that the tourism sector contributes significantly to the national economy. Especially in areas where aquaculture forms an integral part of the local culture/identity, stronger linkages between the tourism, gastronomy and aquaculture sectors could be instrumental to diversifying both producer incomes as well as local tourism offerings (e.g. food/destination/experience tourism).

v. **Results-Based Management:** Future support programs financed under the EMFF must be re-oriented towards addressing national context-specific challenges and delivering impacts. In order to ensure the efficiency, effectiveness, and equity of public expenditures in the aquaculture sector, future support programs will have to be re-designed in a manner that strengthens the (i) focus on the sector's most pressing development challenges; (ii) targeting and coherence of proposed intervention measures; and (iii) operational efficiency of program management systems. In this regard, the development of evidence-based and stakeholder-driven strategic planning, program implementation, and evaluation processes, methods, and tools (like the stakeholder consultations, survey, and market study facilitated under the STARS RAS) could help program management systems shift their orientation from channeling resources/funds to the aquaculture sector towards delivering results.

vi. **Technology and Innovation:** Newly emerging aquaculture technologies, including digital technologies, have significant potential to improve efficiencies on- and off- aquaculture farms, while reducing costs, facilitating the reallocation of productive resources, improving productivity, enabling innovation and capital-intensification of production, improving the environmental footprint, and connecting aquaculture producers and MSMEs with buyers. Increased use of new (digital) technologies can also have a positive impact on the quality of life in rural and coastal areas and may attract new business start-ups. Importantly, new (digital) technologies could contribute to the transition towards more integrated, sustainable, and circular bio-economy value chains in aquaculture (and other sectors) in rural and coastal areas. Promoting local bio-economy value chains, which leverage technological innovations to further valorize biological resources and waste streams, could support greater resource use efficiencies, address pollution and climate mitigation, increase and diversify producer incomes, and bring economic diversification opportunities to rural and coastal areas.

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10 In 2016, per capita consumption of fisheries and aquaculture products in the EU reached 24.33 kg, which was an increase of 763 grams or 3% from per capita consumption in 2015. Wild products predominated the market in 2016, accounting for 18.61 kg per capita or 76% of the total. This represented the highest amount of the 2012–2016 period and an increase of 723 grams over 2015. Per capita apparent consumption of farmed products in 2016 increased a slight 1% from the previous year, bringing it to 5.72 kg, almost at the 10-year peak level of 5.73 kg reached in 2014. More than half of total per capita apparent consumption of farmed products is represented by salmon (2.08 kg) and mussels (1.01 kg), both stable compared with 2015. Source: European Market Observatory for Fisheries and Aquaculture Products (EUMOFA), *The EU Fish Market – 2018 Edition,* available at https://www.eumofa.eu/documents/20178/132648/EN_The+EU+fish+market+2018.pdf

4. Strategic Objectives and Critical Needs

The strategic vision for aquaculture in Croatia is organized around four (4) strategic objectives. The strategic objectives reflect the policy priorities identified for the advancement of the strategic vision and to seize development opportunities in Croatia. These policy priorities are derived from the extensive sector diagnostic work and stakeholder-driven priority-setting exercises completed under the STARS RAS.

STRATEGIC OBJECTIVE I (SO1):
Increase the Productivity and Climate Resilience of Aquaculture Production

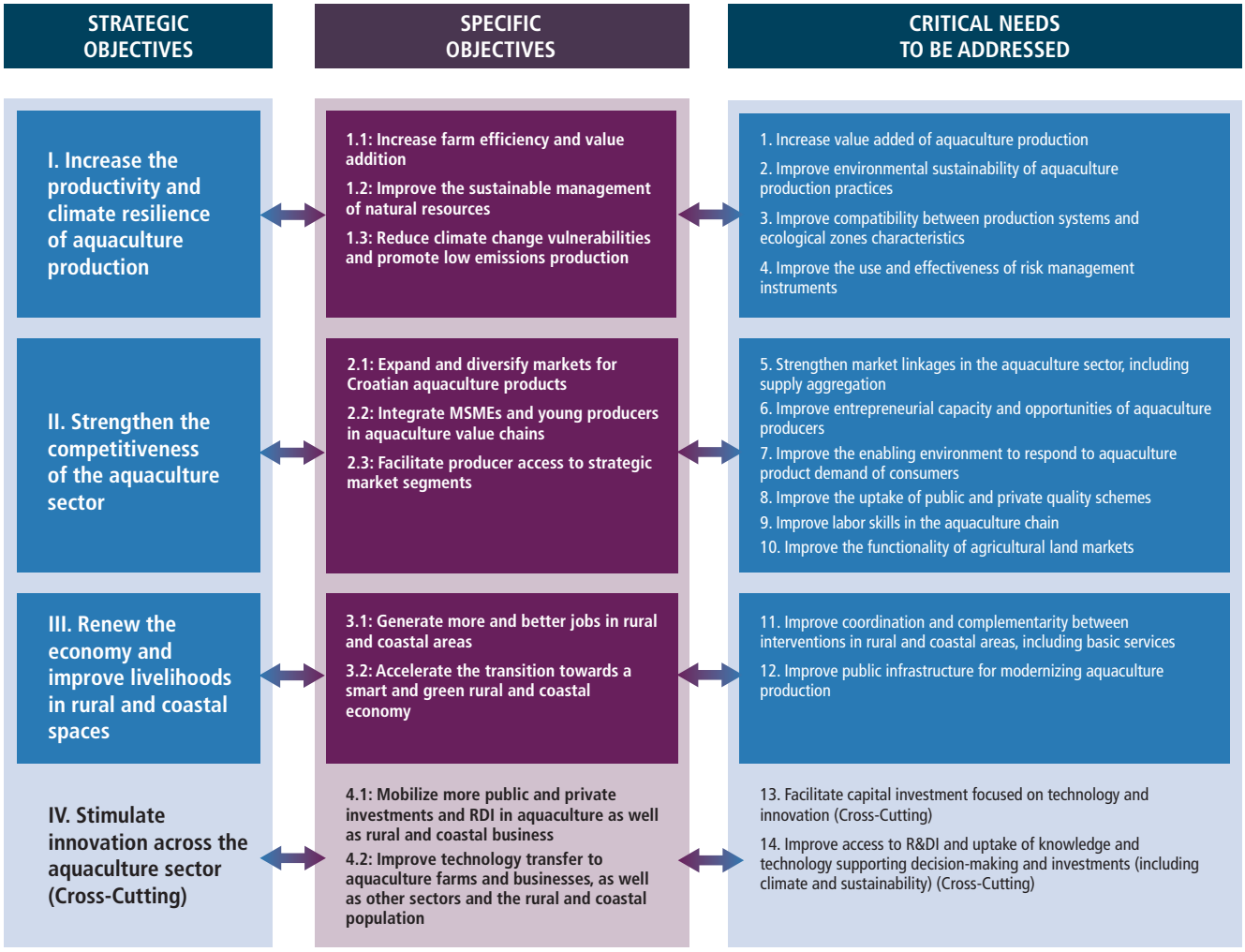
STRATEGIC OBJECTIVE II (SO2):
Strengthen the Competitiveness of the Aquaculture Sector

STRATEGIC OBJECTIVE III (SO3):
Renew the Economy and Improve Livelihoods in Rural and Coastal Spaces

STRATEGIC OBJECTIVE IV (SO4):
Stimulate Innovation across the Aquaculture Sector

To achieve the strategic objectives proposed for the future NSPAD, fourteen (14) critical needs of Croatia's aquaculture sector must be addressed. The critical needs are the key changes that will have to be implemented in Croatia's aquaculture sector in order to achieve the strategic objectives proposed for the future NSPAD. The critical needs are defined on the basis of (i) a strategic (situation) analysis of the various assets, limitations, potentials, and risks that drive the main challenges and opportunities facing Croatia's aquaculture sector, which were identified through the sector diagnostic work completed under the STARS RAS; (ii) the stakeholder priorities expressed during the consultations, workshops, and surveys facilitated under the STARS RAS; and (iii) the articulation of a theory of change that justifies critical needs on the basis of their potential contribution to the achievement of the strategic objectives/priorities proposed for the future NSPAD. Figure 1 presents an overview of the linkages (visualized as specific objectives) between the four broader strategic objectives/policy priorities and the fourteen more specific and targeted critical needs. .

Figure 1. Overview of Linkages Between Strategic Objectives and Critical Needs



STRATEGIC OBJECTIVE I.

Increase the Productivity and Climate Resilience of Aquaculture Production

Critical Need 1: Increase value-added of aquaculture production

Description	Increase the economic value created and retained by aquaculture production through appropriate public expenditures and private investment focused on the development and adoption of improved technologies and best input, water, and other management practices, while diversifying the production structure (e.g. species) and production activities.
Justification	While current technologies perform well in the mariculture sub-sector and the number of farms and subsequent productivity have both increased over the past decades, the situation very different in the freshwater aquaculture sector. This is mainly due to underused existing resources, and to the aging, inefficient production systems and technologies that characterize freshwater aquaculture in Croatia. For example, cold water salmonid (e.g. trout) production uses conventional flow-through technologies employing raceways, which depend on external water sources. On the other hand, warm water fish production (mostly involving different varieties of carp) is based on carp ponds which were built in the first half of the 20th century. Meanwhile, the shellfish industry relies on an extensive production model employing hanging structures suspended below floating rafts (long-lines) and continuous production is wholly based on the collection of fry from nature. The shellfish industry is also lacking infrastructure, distribution and efficient purification centers, waste mitigation solutions, hatcheries, and an efficient marketing strategy Successful aquaculture production in Croatia will therefore require both increased investment in modern infrastructure, production systems, and technologies in these underperforming sub-sectors, as well as skilled management and innovation. In this context, addressing public and private food quality standards, access to financing, and surmounting industry fragmentation and the resulting scale diseconomies are equally important components to increasing farm efficiency and providing added value. Furthermore, increasing production efficiency and value addition are closely tied to development in markets. Croatian fresh water aquaculture has historically focused on the production of a limited number of fish species (e.g., carp and trout), while the Croatian shellfish industry is limited to the European flat oyster and Mediterranean black mussel. This production structure limits the ability of the sector to respond to changing consumer demands and trends. There should be a focus on diversifying production to include high value species. For example, some high value, warm water species are already grown in very small quantities in carp ponds (e.g. wels and pike perch), and very well known to Croatian and European consumers. In addition, diversifying production activities (breeding, processing and product diversification, and recreation/hospitality), developing an export orientation, and developing a coordinated marketing strategy for Croatian aquaculture products are related strategies that have important implications for the production side.
Primary Links to Strategic Objective 1	Specific Objective 1.1.: Increase farm efficiency and value addition

Critical Need 2: Improve environmental sustainability of aquaculture production practices

Description	Provide incentives and develop new institutional responses to increase the levels of adoption of best environmental management practices and technologies supporting climate-smart and sustainable aquaculture, including improved habitat and predator management, sustainable water use and quality, efficient and renewable energy uses, improved waste management practices and pollution control, and effective disease management and control.
Justification	The aquaculture sector is highly dependent on the availability, quality and sustainability of its natural resource base. But that base is affected by a variety of environmental pressures, constraints, and requirements. The specific impacts of climate change on the aquaculture sector are many and often location-specific.

	They include, in the short run, loss of production or infrastructure due to extreme events, fish diseases, toxic algae blooms and parasites, and other negative impacts on production conditions. In the long run, other impacts may include scarcity of wild seed for shellfish cultivation (already observed over the past two decades), limited access to freshwater sources, lower productivity due to suboptimal farming conditions, eutrophication and other effects. Climatic changes in marine environments, including ocean acidification, can be especially detrimental for cultivation of shellfish such as oysters, mussels, and clams. Meanwhile, salmonid (e.g., trout) production in Croatia depends substantially on the quality and temperature of external water sources used in raceways, which is under threat both from climate change and other demands on water resources. Environmental constraints – especially related to ecosystem conservation, wildlife protection, water use/quality, waste treatment, and GHG emissions reduction – as well as the legal and regulatory requirements that frame management decisions associated with these constraints, represent additional challenges that successful aquaculture producers must deal with. For example, warm water (e.g., carp) fish production is dependent on the sustainability of the semi-natural wetland ecosystems characterizing fish ponds, and on producers seeking to optimize fish production while simultaneously minimizing bird predation and damage to pond ecosystems. By doing so, the aquaculture sector is important for the maintenance and conservation of biological diversity in the country and cushioning the vulnerability of the local environment. Relatedly, the problems posed by fish disease and biosecurity highlight the importance of future measures for disease prevention against the spread of specific bacterial and viral pathogens, as well as good management, controls and biosecurity procedures.
Primary Links to Strategic Objective 1	Specific Objective 1.1.: Increase farm efficiency and value addition Specific Objective 1.2.: Improve the sustainable management of natural resources Specific Objective 1.3: Reduce climate change vulnerabilities and promote low emissions production

Critical Need 3: Improve compatibility between production systems and ecological zones characteristics

Description	Foster greater alignment between aquaculture production systems and the ecological features of the production landscapes or seascapes by strengthening land and water use planning for aquaculture ponds, by optimizing off-shore locations for mariculture, by improving data collection tools, integrated data management platforms, user-oriented systems for transferring knowledge and information, and by enhancing the capability of producers and other sector participants to use the improved information and knowledge base.
Justification	The environmental and management challenges posed to aquaculture producers are significant, highlighting the need for integrated management and planning. As one example, the legal protection accorded to both wetlands and bird species creates a fundamental problem in reconciling successful fish farming with wildlife protection. In general, however, integrated management and planning are constrained, among other things, by a lack of data and information on key production, market, and environmental/climate indicators (e.g. status of pond infrastructure, production unit-level performance data, climatological conditions, water supplies sourced by individual farms). Furthermore, although a number of counties (e.g. Zadar County) have streamlined spatial planning, environmental impact assessment, freshwater usage rights, and permitting procedures for the mariculture subsector, incomplete synchronization as well as insufficient stakeholder awareness and support at the local level of these procedures (in particular in the freshwater subsector) may prevent the creation of new aquaculture operations in specific production landscapes or seascapes, and may amplify conflicts with other sectors/users in rural and coastal areas (e.g. tourism, construction, capture fisheries, etc.).
Primary Links to Strategic Objective 1	Specific Objective 1.1.: Increase farm efficiency and value addition Specific Objective 1.2.: Improve the sustainable management of natural resources Specific Objective 1.3: Reduce climate change vulnerabilities and promote low emissions production

Critical Need 4: Improve the use and effectiveness of risk management instruments

Description	Increase the access of aquaculture producers and MSMEs (especially smaller aquaculture producers, in particular women and youth) to tailored financial and risk management solutions, in particular through a better targeting of public support for risk management measures on the basis of transparent damage assessment methods, by leveraging matching grant programs, and by enabling better risk assessments through the development of integrated data management platforms for decision-making that provide access to key production, market, and environmental/climate data.
Justification	Access to credit remains limited for smaller aquaculture producers and MSMEs as they continue to be perceived by commercial banks as higher risk-low return investment opportunities. In addition, the provision of insurance products tailored to the aquaculture sector is low, there is still no elaborate co-financing system for producers suffering damage from protected species such as fish-eating birds (e.g. egrets), among others, and aquaculture operations' capacity to manage climate and market risks is generally low.
Primary Links to Strategic Objective 1	Specific Objective 1.1.: Increase farm efficiency and value addition Specific Objective 1.3: Reduce climate change vulnerabilities and promote low emissions production

STRATEGIC OBJECTIVE II.

Strengthen the Competitiveness of the Aquaculture Sector

Critical Need 5: Strengthen market linkages in the aquaculture sector, including supply aggregation

Description	Improve the level of organization of smaller aquaculture producers in Croatia, while facilitating increased cooperation between smaller producers and buyers in the production, processing, and marketing of aquaculture products.
Justification	Well-functioning aquaculture value chains help create, deliver, and capture market value and opportunities by closely coordinating actions between upstream and downstream value chain stakeholders. However, the development and expansion of well-functioning aquaculture value chains in Croatia is limited by a number of constraints in the operating environment, including limited hatchery capacity for key aquaculture species, the small scale and fragmentation of many aquaculture producers (freshwater aquaculture and shellfish farms in Croatia, in particular, suffer from lower scale efficiencies in addition to technical inefficiencies), the absence of strong producer organizations, weak market linkages, and limited processing capacities. Weak horizontal linkages (among producers) and vertical integration (between producers and buyers) raise transactions costs, increase dependency on imports for key inputs, weaken the negotiating position of smaller producers, and constrain access to sufficiently large volumes of products with uniform quality at competitive prices for processors as well as hotels and restaurants in the growing tourism sector.
Primary Links to Strategic Objective 2	Specific Objective 2.1.: Expand and diversify markets for Croatian aquaculture products Specific Objective 2.2.: Integrate MSMEs and young producers in aquaculture value chains Specific Objective 2.3.: Facilitate producer access to strategic market segments

Critical Need 6: Improve entrepreneurial capacity and opportunities of aquaculture producers

Description	Promote the Croatian aquaculture industry among private investors and financial institutions as a profitable business by presenting generic feasibility studies and success cases, reduce administrative burdens to attracting more businesses to the aquaculture sector, and improve the business management, financial literacy, recordkeeping and accounting, marketing, and digital skills of (young) aquaculture producers MSMEs, and entrepreneurs. Reduce administrative burdens to attracting more young producers and business start-ups to the aquaculture sector and rural/coastal areas (e.g. the slow adoption of land management plans at the county level and low transparency regarding the status of these processes) and provide more opportunities for women entrepreneurs, including business development support services.
Justification	Weak business management and planning capacity among aquaculture producers and businesses constrains their engagement with modern aquaculture value chains, investors, and financial institutions. Meanwhile, complex regulatory and administrative procedures, in particular in relation to spatial planning, environmental impact assessment, freshwater usage rights, and permitting procedures, weaken the competitiveness of aquaculture producers and businesses by creating a business environment that imposes high transaction costs, especially on smaller producers and MSMEs.
Primary Links to Strategic Objective 2	Specific Objective 2.2.: Integrate MSMEs and young producers in aquaculture value chains

Critical Need 7: Improve the enabling environment to respond to aquaculture product demands of consumers

Description	Improve the access of aquaculture chain actors to strategic production, market, and environmental/climate information as well as tailored financial, logistics, and technical support services required to access strategic market segments.
Justification	Access to information and support services for value chains often help create the most value added by facilitating efficient linkages between producers, producer groups/clusters, and markets. In particular, recent World Bank analysis determined that the *frequency of delivery* required for a given food product is a key differentiating factor for profitability in Croatia's broader agri-food sector. The aquaculture sector could therefore significantly strengthen its competitive position by targeting advanced consumer (convenience/ indulgence), product (fresh and perishable), and market (bio-economy) value-added segments that require more frequent delivery. However, rural and coastal infrastructure as well as logistics functions currently employed in Croatia remain poorly aligned with the differentiation needs of the aquaculture sector. Croatia currently performs poorly on a range of logistics-related indicators and only 30-40% of Croatian companies currently outsource logistics (compared to the EU average of 70%). Particularly for fresh and perishable aquaculture products produced by smaller producers and MSMEs without internal logistics capabilities, achieving competitiveness will be difficult without third-party logistics providers who are able to provide transportation solutions and other coordination services to aquaculture value chains.
Primary Links to Strategic Objective 2	Specific Objective 2.1.: Expand and diversify markets for Croatian aquaculture products Specific Objective 2.2.: Integrate MSMEs and young producers in aquaculture value chains Specific Objective 2.3.: Facilitate producer access to strategic market segments

Critical Need 8: Improve the uptake of public and private quality schemes

Description	Scale up the adoption of better management practices and systems promoted under public and private standards and certification schemes, in particular those governing the organic food, environmental protection and conservation, food and feed safety, food hygiene, animal health and welfare, food (origin) labeling and information, and traceability aspects of aquaculture production, processing, and marketing.
Justification	The steady introduction of stringent public standards related to environmental protection and conservation, food and feed safety, food hygiene, animal health and welfare, food labeling and information, and traceability have raised barriers to enter and compete in both domestic and EU markets. At the same time, as part of the consolidation trend in the modern retail sector, retailers are increasingly managing their sourcing requirements and supply chain relationships with producers and processors through private standards to address food safety, quality, and environmental concerns, which usually go beyond the public requirements, while retaining price-sensitive consumers. Unless Croatia's aquaculture producers and processors are able to comply with these requirements in a cost-effective manner, their competitive position in domestic and EU markets will likely weaken. Meanwhile, growth in alternative production systems and voluntary quality standards and certification systems is expected to continue to be higher than for conventional products in the future years. Specialty products create key opportunities for smaller aquaculture producers and processors to compete with larger market players. However, compliance and marketing costs associated with voluntary quality standards and certification systems can be prohibitive in the absence of strong producer or community-based organizations (e.g. Fisheries Local Action Groups–FLAGs–, NGOs, etc.) and the provision of tailored financial support to compensate for temporary losses incurred during the conversion process, especially for smaller aquaculture producers and processors. Adequate support from producer organizations or community-based organizations is equally important to strengthen quality and environmental management processes linked to aquaculture products, which still suffer from consumer perception issues when compared with wild fishery products. In this regard, the lack of a clear and coordinated industry marketing strategy currently limits aquaculture product awareness by consumers, including domestic consumers.
Primary Links to Strategic Objective 2	Specific Objective 2.1.: Expand and diversify markets for Croatian aquaculture products Specific Objective 2.2.: Integrate MSMEs and young producers in aquaculture value chains Specific Objective 2.3.: Facilitate producer access to strategic market segments

Critical Need 9: Improve labor skills in the aquaculture chain

Description	Align the technical skill levels of aquaculture producers, processors, and workers, in particular women (who constitute a significant portion of agricultural workers) with those required for the development of production and marketing systems that are increasingly capital and knowledge intensive, quality-oriented, managed sustainably, and enabled by new (digital) technologies, while enabling them to diversify towards more service-oriented activities in the tourism sector.
Justification	Various labor constraints affect the aquaculture sector. They are driven by several factors, including weak labor productivity levels, low labor force participation, emigration of young people from rural areas, and skills mismatches. These constraints constitute important barriers to repositioning the aquaculture sector towards more value-adding activities. On the other hand, the integration of more young producers and entrepreneurs in aquaculture value chains could be effective in improving labor productivity levels given that they tend to be more adept at implementing the technical changes required by increasingly capital-, knowledge-, and technology-intensive production systems. Integration of women producers and entrepreneurs into modern aquaculture value chains could help stem rural outmigration by creating new job opportunities (especially in the value addition sub-sector, which tends to be dominated by women) and allow them to contribute to the transformation of the aquaculture sector.
Primary Links to Strategic Objective 2	Specific Objective 2.1.: Expand and diversify markets for Croatian aquaculture products Specific Objective 2.2.: Integrate MSMEs and young producers in aquaculture value chains Specific Objective 2.3.: Facilitate producer access to strategic market segments

Critical Need 10: Improve the functionality of agricultural land markets

Description	Facilitate efficient and transparent agricultural land administration and management systems that reduce the time and transaction costs associated with renting and selling both private and public agricultural land for freshwater aquaculture investments.
Justification	Although Croatia has relatively abundant agricultural land, it generally remains underutilized. Agricultural land markets have an important role to play for efficient and sustainable land management and inclusive development. However, freshwater aquaculture investments are at times deterred by unresolved property rights issues as a result of inconsistencies between land cadaster and land registration information, which complicate entrepreneurs' access to both private and public agricultural land.
Primary Links to Strategic Objective 2	Specific Objective 2.2.: Integrate MSMEs and young producers in aquaculture value chains

STRATEGIC OBJECTIVE III.

Renew the Economy and Improve Livelihoods in Rural and Coastal Spaces

Critical Need 11: Improve coordination and complementarity between interventions in rural and coastal areas, including basic services

Description	Integrate territorial investments at the regional and local level supported through different sector program in a manner that reduces conflicts and promotes increased linkages within and across natural resource-based sectors and value chains in rural and coastal areas, including improving the quality of basic public services in rural and coastal areas (including care services which free up the time of rural/coastal women for productive work) and align them, where appropriate, with the needs of sustainable and circular bio-economies (e.g. waste management, electricity, heating, education, environmental protection, and water supply services).
Justification	The structural transformation process of the aquaculture sector could be further accelerated by leveraging the economic links between the sector and other bio-based industries and services in the broader rural and coastal economy. However, the creation of new income and job opportunities in modern aquaculture value chains and rural/coastal sectors that are closely linked to these value chains, critically depends on an adequate spatial targeting at both the regional and local level of public incentives, investments, goods, and services supported through different sector policies and programs. Concretely, territorial development outcomes critically depend on the way in which government institutions in Croatia coordinate their interventions and engage with the private sector, civil society, and individuals at each spatial planning level. While some best practices have emerged at the level of a number of counties (e.g. Zadar), the effective coordination of multi-sectoral interventions and stakeholders in rural and coastal areas in Croatia is often constrained by the administrative and territorial fragmentation of Croatian government institutions. Inadequate coordination between public, private, and civil society stakeholders at the national, regional, and sub-regional levels increases the risk of duplication of territorial investments and a lack of critical mass for impact.
Primary Links to Strategic Objective 3	Specific Objective 3.1.: Generate more and better jobs in rural areas Specific Objective 3.2.: Accelerate the transition to a smart and green rural and coastal economy

Critical Need 12: Improve public infrastructure for modernizing aquaculture production

Description	Upgrade physical infrastructure in rural and coastal areas, which supports the delivery of efficient logistics, next-generation digital technology services, freshwater, as well as renewable energy and energy efficiency improvements to aquaculture producers and processors.
Justification	The dependency of incomes and jobs on primary sector activities must be reduced to help renew local economies and improve livelihoods in rural and coastal spaces. Increased investment in public infrastructure and services that help connect rural and coastal areas to opportunities provided by modern aquaculture chains, the growing tourism sector, and the new (digital and bio-) economy could be instrumental in closing persistent local development gaps. Although Croatia benefits from modern, well-developed road infrastructure, its rural and coastal infrastructure faces a number of distinctive development opportunities, including improving water delivery infrastructure; expanding Next Generation Access (NGA) broadband coverage at the national and (especially) rural and coastal levels; increasing energy efficiency particularly in the (rural) household and district heating sectors; and energy generation systems utilizing renewable (bio-based) sources such as distributed generation and mini-grid systems. Croatia, with its remote island regions, far away from power, heat and gas networks, could benefit significantly from developing such renewables-based energy generation systems.
Primary Links to Strategic Objective 3	Specific Objective 3.1.: Generate more and better jobs in rural areas Specific Objective 3.2.: Accelerate the transition to a smart and green rural and coastal economy

STRATEGIC (CROSS-CUTTING) OBJECTIVE IV.

Stimulate Innovation across the Aquaculture Sector

Critical Need 13: Facilitate capital investment focused on technology and innovation (Cross-Cutting)

Description	Leverage public funds for aquaculture development to channel increased private investment into applied research activities and achieve the introduction of new technologies and products, promotion of improved management practices, and innovative solutions by aquaculture producers and processors.
Justification	The low capital investment in Croatia's broader agri-food sector, relative to EU countries, is a significant constraint in the aquaculture industry, particularly given the dependence of the sector on technology, and consequently, the investment in that technology needed to stay competitive. In fact, all aquaculture subsectors are highly dependent on the development, and producer adoption, of modern technologies which require constant updating and improvement. In general, the Croatian Agricultural Knowledge and Innovation System (AKIS) is strongly oriented towards basic research in the public sector. In aquaculture, private companies, input providers and advisors also form an important part of AKIS as their advisory services and products are offered individually or certain forms of productive partnerships. However, there is only limited support for research, development, and innovation by companies, faculties, and research institutes through tax incentives or other measures. Moreover, government support is not focused adequately on value-added production. Overall, investments in the aquaculture sector should aim not only at improving and modernizing existing technologies and production practices but at innovations that lead to new technologies and new knowledge, that enhance competitiveness, improve food, feed and fish safety and quality, develop new food products, etc.
Primary Links to Strategic Objective 4	Specific Objective 4.1: Mobilize more public and private investments in RDI in aquaculture as well as rural and coastal businesses

Critical Need 14: Improve access to R&DI and uptake of knowledge and technology supporting decision-making and investments (including climate and sustainability) (Cross-Cutting)

Description	Improve coordination, collaboration and partnerships between aquaculture producers and other food chain actors including knowledge generation and transfer institutions, increase public support particularly for applied research innovations and their dissemination and adoption, and invest in skills and knowledge of advisors, especially as regards compliance requirements and transformative innovations (digital technologies, climate-smart and sustainable aquaculture, information and data exchange).
Justification	The goal of Croatia's AKIS system is to provide producers with information, training, technical advice, and learning networks that relate to innovations in (digital) technologies, regulatory compliance requirements, as well as management and production practices, which take into account international innovations that are relevant to the national context. Croatia has a variety of AKIS institutions that provide sources of expertise in these areas for aquaculture specifically. Notwithstanding these many players, AKIS actors in aquaculture are fragmented and functional cooperation in research, education, training and advisory services is limited. In particular, producers and other stakeholders have to be familiarized with the existing mechanisms for sharing and transferring knowledge and innovations and some of these mechanisms could be improved. The National Strategic Plan for Aquaculture, 2014-2020, appropriately cites increasing cooperation between the scientific community and the sector as one of its chief priorities. This is particularly true in freshwater aquaculture, where there is significant potential to improve firm efficiency, input utilization and scale of operation through innovation, improved information, and knowledge. Improving the integration of the knowledge and information system for aquaculture will be additionally important in managing the digital transformation of the aquaculture sector, scaling up sustainable management practices and technologies, and addressing issues of climate resilience as climatic changes increasingly occur.
Primary Links to Strategic Objective 4	Specific Objective 4.2.: Improve technology transfer to aquaculture farms and businesses, as well as other sectors and the rural and coastal population

5. Roadmap

To address the critical needs associated with each strategic objective, specific interventions are proposed, grouped under five (5) key lines of action. Each line of action consists of a sub-set of related interventions, which are aimed at addressing specific agri-food sector critical needs identified under each Strategic Objective. Annex I provides an overview of the linkages between the proposed interventions and the critical needs identified under each strategic objective.

ACTION A:
Target public and private funds towards green and value creating investments in aquaculture

ACTION B:
Strengthen the capacity of aquaculture producers to manage climate risks and protect the environment

ACTION C:
Facilitate the development of dynamic and inclusive aquaculture value chains

ACTION D:
Maximize synergies between the aquaculture sector and related sectors in rural and coastal areas

ACTION E:
Foster strong and integrated support systems for knowledge-based aquaculture development and innovation

ACTION A.

Target public and private funds towards green and value-creating investments in aquaculture

SPECIFIC INTERVENTIONS
A.1. Incentivize more investments in efficient and sustainable aquaculture technologies and solutions
A.2. Support investments in larger production capacities with higher profit capabilities
A.3. Stimulate the development of new aquaculture products with higher added value

Intervention A.1. Incentivize more investments in efficient and sustainable aquaculture technologies and solutions

Description	Projects focused on aquaculture technologies and solutions that promote socioeconomic and environmental sustainability would be encouraged and supported. In particular, support would prioritize innovative projects that increase the sustainability and profitability of aquaculture businesses by (i) using climate smart and digital technologies; and (ii) improving environmental management systems for treating waste water and processing wastes and dead fish (especially if they are used for production of different by-products). Projects thus prioritized would target investments in (i) environmentally sustainable intensification of aquaculture production systems (RAS, IMTA, CIE systems, aquaponics), including through the integration of digital technologies; (ii) synergistic aquaculture and agriculture operations that would include RAS fish production, agriculture and aquaculture waste and waste water mitigation, as well as biogas production based on aquaculture production and processing and the utilization of agriculture waste; (iii) the introduction of sustainable water use technologies and solutions (see also intervention E.2.), including RAS, innovative procedures for pond and flow-through farming systems that conserve water, and production systems with minimal water discharge; and (iv) the establishment of rearing technology and feed management standards for different rearing systems that prevent or minimize the introduction of excessive nutrients into surrounding water and sediment, that contribute to local eutrophication and to the general deterioration of the environment. Furthermore, producers would be rewarded for the adoption and maintenance of (i) best water management practices based on the level of water conservation and discharges; (ii) optimal fish feeding strategies and fish nutrition in different types of production systems that use sustainable alternative and non-traditional feeds and additives. Importantly, the investment support thus provided would be completed by technical assistance resources to secure access to public funding for technology transfer, research and innovation provided under different EU support programs such as Horizon European and the ERDF. In addition, support would be provided to technology transfer and innovation partnerships involving producers, advisors and scientific institutions (see also intervention E.4). These partnerships would follow an interactive innovation model whereby scientific institutions are focused on solving "real-world" issues and challenges that producers meet on the ground. To effectively implement this new innovation model, a program management system of frequent calls for applications would be developed to enable more rapid responses to farmers' needs and faster provision of the required solutions. Improved dissemination of the results generated by the innovation partnerships would be supported through the development of new, digital information and communication systems and tools (see also Intervention E.2.).

Primary Link(s) to Critical Needs	• Increase value added of aquaculture production • Improve environmental sustainability of aquaculture production practices • Improve the use and effectiveness of risk management instruments • Strengthen market linkages in the aquaculture sector, including supply aggregation • Improve the uptake of public and private quality schemes • Facilitate capital investment focused on technology and innovation (Cross-Cutting)
Responsible Agency/ies	Ministry of Agriculture
Funding Source(s)	EMFF (Art.23), EU Invest, National Budget
Targeted Actor(s)	Producers, Producer Organizations, Advisory Services, Scientific Institutions
Key Sub-Sector(s)	Not specified
Territorial Focus	N/A
Thematic Priority/ies	Knowledge and Innovation, Competitiveness, Climate Adaptation, Renewable Energy, Energy Efficiency, Water Use, Water Quality, Pollution Control, Waste Management, Nutrient Management, Precision Aquaculture, Bio-Economy

Intervention A.2. Support investment in larger production capacities with higher profit capabilities

Description	Capital investments in aquaculture production capacities would be supported, including investments in efficient and sustainable aquaculture technologies and solutions (see also Intervention A.1.). The investment support thus provided would be complemented by (grant) support for the development of feasibility studies and business plans for large aquaculture projects as well as financial incentives to encourage merging of smaller aquaculture companies (see also Interventions C.2., D.2.). Targeted promotions of investment opportunities in Croatian aquaculture production would be organized to attract investors, including promotion of investment opportunities in Croatian aquaculture sector on international investors' events, presenting the aquaculture industry to private and institutional investors as a profitable and environmentally sustainable business model, publicizing industry success cases, and establishing a 'one-stop shop' with guidance documents for investors, exchanges of best practices, etc.. The latter would be an integral part of the proposed Central Aquaculture Information System and Knowledge Hub (see also Intervention E.2.).
Primary Link(s) to Critical Needs	• Strengthen market linkages in the aquaculture sector, including supply aggregation • Improve entrepreneurial capacity and opportunities of aquaculture producers • Facilitate capital investment focused on technology and innovation (Cross-Cutting)
Responsible Agency/ies	Ministry of Agriculture, Ministry of Economy, Entrepreneurship and Crafts
Funding Source(s)	EMFF (Art.23), EUInvest, Financial Instruments, National Budget
Targeted Actor(s)	Producers, Producer Organizations, MSMEs, Processors, Distributors, Investors
Key Sub-Sector(s)	Not specified
Territorial Focus	N/A
Thematic Priority/ies	Competitiveness, Access to Finance, Cost-Benefit Analysis, Investment Promotion, Aqua-Food Chain Integration

Intervention A.3. Stimulate the development of new aquaculture products with higher added value

Description	Investments in the introduction of new species would be supported. In particular, support would be provided for the introduction of new species that are already in the research phase and show promising aquaculture potential. For example, there is an increased interest in the EU and in Croatia in the intensive cultivation of high value warm water species which are presently grown in small quantities in carp ponds (e.g. pike perch, European catfish, pike, etc.) and would justify investments in more sophisticated intensive production systems (RAS) that guarantee controlled growing conditions, shorter production cycle, safe product, climate change resilience and easy treatable waste waters. Support provided for this type of investment would also include connecting producers with scientific and research institutions in order to establish optimal research project or pilot production (see also Intervention E.4) and, in a later phase, connect successful projects with the investment community interested in investing in aquaculture businesses (see also Intervention A.2). Furthermore, support would be provided for the introduction and the cultivation of foreign profitable species with technologically and financially defined breeding technology (e.g. salmon, pangasius, tilapia, channel catfish, largemouth bass). In this context, relevant closed systems would need to be evaluated to prevent the possibility of unwanted introduction of breeding alien species into the surrounding environment. In addition, support would be provided for product diversification and new product promotion activities, especially for sea bass, sea bream, cyprinids and trout, which are currently in the initial stages of development. Finally, financial incentives would be provided for the merger of smaller processing and packaging operations, which could lower production cost, enhance marketing efforts and lower transport cost (see also Intervention A.2).
Primary Link(s) to Critical Needs	• Increase value added of aquaculture production • Strengthen market linkages in the aquaculture sector, including supply aggregation • Facilitate capital investment focused on technology and innovation (Cross-Cutting)
Responsible Agency/ies	Ministry of Agriculture
Funding Source(s)	EMFF (Art.24,25), EUInvest, National Budget
Targeted Actor(s)	Producers, Producer Organizations, MSMEs, Scientific Institutions, Processors
Key Sub-Sector(s)	Not specified
Territorial Focus	N/A
Thematic Priority/ies	Diversification, Knowledge and Innovation, Aqua-Food Chain Integration

ACTION B.

Strengthen the capacity of aquaculture producers to manage climate risks and protect the environment

SPECIFIC INTERVENTIONS
B.1. Promote the application of efficient health management practices
B.2. Improve habitat and predator management on aquaculture farms
B.3. Develop relevant risk management instruments supporting sustainable aquaculture investments
B.4. Improve access to climate and environmental data for public and private aquaculture sector stakeholders

Intervention B.1. Promote the application of efficient health management practices

Description	Responsible aquaculture farming involves technological and sanitary measures that ensure proper health management on the farm, including early diagnoses and preventive interventions that increase both fish welfare and product safety. In addition to fish disease control measures at the national level, aquaculture farms should develop their own biosecurity plans. Increased support would therefore be provided for the development and implementation of bio-security plans. In particular, support would be provided in the form of broadly defined payments would be directed to producers for their adoption of efficient health management practices. The payments would focus primarily on practices promoting disease prevention measures (including the use of immune stimulants and other measures that will increase immunity, either specific or non-specific), limiting the use of antibiotics and other veterinary medicines, and climate change adaptation. The payments would complement support provided for "hard" investments in climate smart and sustainable technologies and solutions under intervention A.1. Crucially, systems for delivering knowledge and information required to implement efficient health management practices and related investments would be improved to respond to the needs of producers (see also Interventions B.4. and E.2.).
Primary Link(s) to Critical Needs	• Increase value added of aquaculture production • Improve environmental sustainability of aquaculture production practices • Improve the use and effectiveness of risk management instruments • Improve the uptake of public and private quality schemes • Improve access to R&DI and uptake of knowledge and technology supporting decision-making and investment (including climate and sustainability) (Cross-Cutting)
Responsible Agency/ies	Ministry of Agriculture
Funding Source(s)	EMFF (Art.23), Horizon Europe, National Budget
Targeted Actor(s)	Producers, Producer Organizations, Scientific Institutions, Advisory Services
Key Sub-Sector(s)	White Fish; Tuna; Cold Freshwater; RAS
Territorial Focus	N/A
Thematic Priority/ies	Food Safety and Quality Standards, Antibiotic Use, Fish Health & Welfare, Pollution Control, Water Quality, Waste Management, Precision Aquaculture

Intervention B.2. Improve habitat and predator management on aquaculture farms

Description	A code of good practices and accompanying guidelines would be established and disseminated for aquaculture and other commercial activities in protected areas (Natura 2000 Sites, etc.) that seek to balance land use interests with the effective conservation of aquatic biodiversity. In addition, the development, implementation, and monitoring of realistic site management plans would be supported that manage relations between all stakeholders. In this context, an efficient compensation mechanism would be implemented on the basis of defined methods for estimating the actual damage and loss of income caused by direct and indirect activity protected predator. Financial support would also be provided to innovative solutions for mitigating predator damages through preventive measures that would preserve the protected habitat and secure profitability of semi-intensive carp production (see also intervention A.1.). For example, support could be provided for the introduction of new technologies in pond aquaculture such as the inclusion of closed recirculation technology in the first year of carp production and then stock outdoor ponds with bigger fish that are less susceptible to bird predation. This scenario would improve the survival and health of outdoor (pond) culturing population of fish and shorten the carp production cycle. Finally, financial support mechanisms would be established for the conversion of traditional semi-intensive carp ponds to multifunctional facilities that offer recreation, education and biodiversity education services, as well as commercial production. These facilities could form a part of the development of food destination packages proposed for the future NSPAD.
Primary Link(s) to Critical Needs	• Improve environmental sustainability of aquaculture production practices • Improve compatibility between production systems and ecological zone characteristics • Improve the use and effectiveness of risk management instruments
Responsible Agency/ies	Ministry of Agriculture, Ministry of Environmental Protection and Energy
Funding Source(s)	EMFF (Art. 22, 23), National Budget
Targeted Actor(s)	Producers, Producer Organizations, Civil Society Organizations, Tourism Operators
Key Sub-Sector(s)	Not Specified
Territorial Focus	Natura 2000 Sites
Thematic Priority/ies	Animal Health & Welfare, Pollution Control, Predator Management, Water Quality, Knowledge and Innovation, Ecosystem Conservation, Diversification

Intervention B.3. Develop relevant risk management instruments supporting sustainable aquaculture investments

Description	New customized risk management solutions would be developed and implemented to improve access of aquaculture producers (in particular women and young people), producer groups, and MSMEs to finance for the modernization of farming systems, adoption of climate smart and sustainable aquaculture technologies and solutions, and value adding activities. In particular, private/commercial loans to small and medium-sized producers and businesses in the aquaculture sector would be further incentivized by reducing financial risks through blended financial instruments, which combine commercial lending with risk sharing facilities (guarantees), investment support (matching grants) and technical assistance to investees. These financial instruments would be further supported through the promotion of coordinated spatial plans (see Intervention D.1), aquaculture investments (see Intervention A.2), as well as data platforms and applications that enable improved access to production, market, environmental, and climatic data for both public institutions and private aquaculture chains stakeholders (see Intervention B.4.). Importantly, investments in efficient and sustainable aquaculture technologies and solutions as well as the development and production of new aquaculture products with higher added value would be prioritized (see also Interventions A.1. and A.3), in particular those proposed by young and innovative producers and in the context of productive partnerships between aquaculture producers and buyers (see also Interventions C.1. and C.4.). Finally, specific insurance models for aquaculture producers and businesses will be developed and extended through the creation of mutual funds for small and medium-sized producers and use of commercial re-insurance markets for managing disaster risks.

Primary Links to Critical Needs	• Improve the use and effectiveness of risk management instruments • Improve entrepreneurial capacity and opportunities of aquaculture producers • Improve the enabling environment to respond to aquaculture product demands of consumers • Facilitate capital investment focused on technology and innovation (Cross-Cutting)
Responsible Agency/ies	Ministry of Agriculture
Funding Source(s)	EMFF (Art. 22), Financial Instruments, National Budget, EU technical assistance
Targeted Actor(s)	Producers, Producer Groups, MSMEs, Financial Institutions
Key Sub-Sector(s)	Not specified
Territorial Focus	N/A
Thematic Priority/ies	Access to Finance, Climate Adaptation, Competitiveness, Diversification, Youth

Intervention B.4. Improve access to climate and environmental data for public and private aquaculture sector stakeholders

Description	An integrated data management platform for decision-making would be developed that provides access to key production parameters in aquaculture. In particular, national database would be expanded with climate and environmental data information, while data quality and sharing through the European marine observation and data network (EMODnet) would be increased. The data and information managed in the platform would be used for climate change impact assessments, breeding impact analysis, water resources use optimization modeling, and monitoring adaptation behaviors to climate change. In this context, existing data would be collected and long-term regular monitoring would be established of basic physicochemical parameters relevant to aquaculture production. Additionally, monitoring of relevant disaster parameters and instruments to predict possible natural disasters in particular areas would be developed. The platform would thus provide strategic guidance to investment decisions taken by the Ministry of Agriculture, producers (see also Interventions A.1., A.3.), investors (see also Intervention A.2), financial and insurance institutions (see also Intervention B.3) as well as stakeholders in the broader bio-economy (see also Intervention D.1.). The platform and associated tools would form an integral part of the Central Aquaculture Information System and Knowledge Hub developed under Intervention E.2.
Primary Link(s) to Critical Needs	• Improve the use and effectiveness of risk management instruments • Improve compatibility between production systems and ecological zone characteristics • Improve environmental sustainability of aquaculture production practices • Improve the functionality of agricultural land markets • Improve access to R&DI and uptake of knowledge and technology supporting decision-making and investment (including climate and sustainability) (Cross-Cutting)
Responsible Agency/ies	Ministry of Agriculture, Ministry of Environmental Protection and Energy
Funding Source(s)	National Budget, EMFF, EU-Technical Assistance
Targeted Actor(s)	Producers, Producer Groups, Financial Institutions, Advisory Services, Scientific Institutions
Key Sub-Sector(s)	Not specified
Territorial Focus	N/A
Thematic Priority/ies	Climate Adaptation, Knowledge and Innovation, Precision Aquaculture, Disaster Risk Management

ACTION C.

Facilitate the development of dynamic and inclusive aquaculture value chains

SPECIFIC INTERVENTIONS
C.1. Stimulate productive partnerships between aquaculture producers and buyers
C.2. Strengthen and encourage producer organizations
C.3. Improve support mechanisms for producers to comply with public and private food safety and quality standards
C.4. Support innovative women, youth, and entrepreneurs in starting new aquaculture businesses

Intervention C.1. Stimulate productive partnerships between aquaculture producers and buyers

Description	A support mechanism would be established that incentivizes linkages between producers, domestic buyers (including institutional buyers), and financial institutions with a view to improve existing and develop new distribution chains for aquaculture products. The support mechanisms would take the form of a blended financial instrument (see also Intervention B.3.) that improves small and medium-size producers', including women's, access to commercial finance to implement commercial partnerships in high value manufacturing segments on the basis of joint business plans and investments between producers, processors and buyers. Joint activities supported under the mechanism would include capital investments to upgrade and expand production capacities of aquaculture products (see also Intervention A.2), adoption of better management practices as well as efficient and sustainable technologies and solutions (see also Interventions A.1, B.1, B.2), improved business and financial management capacities (see also Intervention C.4.), stronger producer organizations and marketing (see also Intervention C.2.), compliance with public and private food safety and quality standards (see also Intervention C.3.), improved fish processing, storage and packaging (including fish markets) and development of new value-added fish products focusing on different groups of customers in strategic market segments (see also Intervention A.3.), as well as promotion of food destination tourism (see also Intervention D.3.). For example, considering the increasing number of Asian tourists (who eat and value carp products) in Croatia the collaboration between carp producers, processors, logistic with caterers and hotels could be supported. In addition, the effort of smaller sea bass/sea bream producers who offer cleaning and filleting fish for restaurants and hotels during tourist season could be enhanced by building a common larger processing facility and by establishing proper logistic for moving products to resorts and hotels as well as selected markets in major cities. The support mechanisms would focus in particular on small and medium-sized producers in higher value sub-sectors and those located on islands which have difficulties in putting the aquaculture products on market, especially during the winter. In addition, partnerships between aquaculture producers and institutional buyers, such as hospitals, schools and kindergartens would be prioritized by supporting innovative business models and forms of cooperation that will increase the consumption of aquaculture and fishery products on the domestic market. To stimulate joint incentives between producers, processors and buyers a web-based platform that facilitates communication and information exchange between participants in the chain would be established and complemented with required knowledge and information to implement these actions (see also Intervention E.2.).

Primary Link(s) to Critical Needs	• Increase value added of aquaculture production • Improve environmental sustainability of aquaculture production practices • Improve the use and effectiveness of risk management instruments • Improve entrepreneurial capacity and opportunities of aquaculture producers • Improve the uptake of public and private quality schemes • Improve the enabling environment to respond to aquaculture product demands of consumers • Strengthen market linkages in the aquaculture sector, including supply aggregation • Improve labor skills in the aquaculture value chain • Facilitate capital investment focused on technology and innovation (Cross-Cutting) • Improve access to R&DI and uptake of knowledge and technology supporting decision-making and investments (including climate and sustainability) (Cross-Cutting)
Responsible Agency/ies	Ministry of Agriculture
Funding Source(s)	EMFF (Art. 24), Financial Instruments, National Budget
Targeted Actor(s)	Producers, Producer Organizations, MSMEs, Youth, Processors, Distributors, Tourism Operators, Counties, Municipalities, Financial Institutions, Advisory Services
Key Sub-Sector(s)	Not specified
Territorial Focus	N/A
Thematic Priority/ies	Producer Organization, Business Management, Aqua-Food Chain Integration, Sales and Marketing, Competitiveness, Cold Chain Logistics, Access to Finance, Diversification, Knowledge and Innovation, Public Procurement, Food Safety and Quality Standards, Quality Schemes

Intervention C.2. Strengthen and encourage producer organizations

Description	The level of organization in producing and marketing aquaculture products would be strengthened by supporting the establishment and development of producer organizations (cooperatives, producer associations, FLAGs, etc.) that can act as larger production entities with higher profit and marketing potential. The establishment and development of producer organizations would also be incentivized through the implementation of productive partnerships (see also intervention C.1.). To further demonstrate the advantage of joining producer organizations, financial feasibility studies and successful marketing cases would be developed and demonstrated to relevant stakeholders. Importantly, functional and improved producer organizations would be instrumental to managing climate risks and improving the environmental performance of the aquaculture operations (see also Interventions B.1. and B.2.), improving market linkages and efficient distribution systems, including cold chain logistics (see also Intervention C.1.), ensuring compliance with public and private food safety and quality standards (see also Intervention C.3), disseminating knowledge and information (see also Interventions E.2 and E.3.), accessing finance (see also Intervention B.3.) and the transfer of new technologies (see also Intervention E.4.).
Primary Link(s) to Critical Needs	• Increase value added of aquaculture production • Improve the use and effectiveness of risk management instruments • Strengthen market linkages in the aquaculture sector, including supply aggregation • Improve entrepreneurial capacity and opportunities of aquaculture producers • Improve the enabling environment to respond to aquaculture product demands of consumers • Improve access to R&DI and uptake of knowledge and technology supporting decision-making and investments (including climate and sustainability) (Cross-Cutting)
Responsible Agency/ies	Ministry of Agriculture

Funding Source(s)	EMFF (Art. 24), National Budget
Targeted Actor(s)	Producers, Producer Organizations, Advisory Services
Key Sub-Sector(s)	Not specified
Territorial Focus	N/A
Thematic Priority/ies	Producer Organization, Business Management, Aqua-Food Chain Integration, Sales and Marketing, Competitiveness, Cold Chain Logistics

Intervention C.3. Improve support mechanisms for producers to comply with public and private food safety and quality standards

Description	Targeted investments would be made in developing human resources, methods, processes, systems, and tools that enable the transparent and cost-effective delivery of risk-based public food safety and quality policies and controls in line with EU regulations. Proposed investments would focus in particular on (i) strengthening the MoA's administrative capacity in food safety policy (especially biomedical, biotechnical, and food biotechnology fields) to ensure adequate relationship management with EU institutions and effective communication with producers regarding compliance requirements; (ii) increasing (in-house) IT capacity, upgrading the Central Veterinary Information System (including registries, monitoring and control data management, resource planning), and integrating the CVIS with the proposed Central Aquaculture Information System (see also Intervention E.2); (iii) ensuring the effective implementation of mandatory monitoring and coordinated control programs in the field of food safety and fish health (see also Intervention B.1); (iv) increasing resources for emergency measures; and (v) implementing stronger controls on fish imports to prevent the introduction of diseases. In addition to supporting safe food production as well as the prevention and eradication of diseases, these investments would improve animal health and welfare and promote improved market access for aquaculture producers (see also Interventions C.1. and D.3). Meanwhile, compliance with voluntary quality schemes that go beyond minimum public food safety and quality requirements would be incentivized. In particular, the conversion of producers towards well-recognized certifications (e.g. organic certification, geographical origin indications, fair trade etc.) would be facilitated through tailored investment support, income support and cooperation mechanisms (aqua-food chain, destination tourism) (see also Interventions D.3. and C.1.). Producer access to required knowledge and information, and expert support to implement compliance actions would be improved (see also Intervention E.2. and E.3.). Broader education of all players in the value chain, including producers, marketers and end-users would be encouraged.
Primary Links to Critical Needs	• Increase value added of aquaculture production • Improve environmental sustainability of aquaculture production practices • Improve the uptake of public and private quality standards • Improve the enabling environment to respond to aquaculture product demands of consumers • Strengthen market linkages in the aquaculture sector, including supply aggregation • Improve entrepreneurial capacity and opportunities of aquaculture producers • Improve labor skills in the aquaculture chain • Improve access to R&DI and uptake of knowledge and technology supporting decision-making and investments (including climate and sustainability) (Cross-Cutting) • Facilitate capital investment focused on technology and innovation (Cross-Cutting)
Responsible Agency/ies	Ministry of Agriculture
Funding Source(s)	EMFF (Art. 24), National Budget
Targeted Actor(s)	Producers, Producer Organizations, Processors
Key Sub-Sector(s)	Not specified

Territorial Focus	N/A
Thematic Priority/ies	Organic Aquaculture, Competitiveness, Diversification, Quality Schemes, Food Safety and Quality Standards, Business Management, Consumer Information/Labeling, Traceability, E-Government

Intervention C.4. Support innovative women, youth and entrepreneurs in starting new aquaculture businesses

Description	Financial support would be provided to innovative women, youth and entrepreneurs in starting new aquaculture businesses. In particular, grant support would be provided to aquaculture business start-ups that seek to invest in new aquaculture products, technologies, and chain services (see also Interventions A.1. and A.3.) and/or strengthening market linkages and cooperation (see also Intervention C.1).The business start-up of innovative women, youth and entrepreneurs would moreover be facilitated by improving (i) processes leading to the approval of business activities at all levels (e.g. preparation and adoption of land management plans at the county level); as well as (ii) the transparency regarding these processes would be reinforced by consolidating the status of these processes and related procedures in one central place (see also Intervention E.2.). These actions would be further complemented by the development of digital knowledge management and information platforms and tools (see also Intervention E.2.), risk management instruments (see also Intervention B.3.), and educational and vocational programs dedicated to aquaculture (see also Intervention E.3.)., especially in aspects related to digital aquaculture, quality schemes, circular bio-economy, business management, sales and marketing, financial literacy, record keeping, and accounting.
Primary Link(s) to Critical Needs	• Improve the use and effectiveness of risk management instruments • Improve entrepreneurial capacity and opportunities of aquaculture producers • Improve the enabling environment to respond to aquaculture product demands of consumers • Facilitate capital investment focused on technology and innovation (Cross-Cutting)
Responsible Agency/ies	Ministry of Agriculture, Ministry of Economy, Entrepreneurship and Crafts, Scientific Institutions
Funding Source(s)	EMFF (Art. 23, 25), Financial Instruments, National Budget
Targeted Actor(s)	Producers, Producer Organizations, Youth, Women, Start-Ups
Key Sub-Sector(s)	Not specified
Territorial Focus	N/A
Thematic Priority/ies	Knowledge and Innovation, Competitiveness, Business Management, Access to Finance, Gender, Youth

ACTION D.

Build synergies between the aquaculture sector and related sectors in rural and coastal areas

SPECIFIC INTERVENTIONS
D.1. Reconcile sustainable aquaculture development with nature protection and climate change adaptation
D.2. Connect the aquaculture sector to growth opportunities provided by sustainable and circular bio-economies
D.3. Promote food destination tourism

Intervention D.1. Reconcile sustainable aquaculture development with nature protection and climate change adaptation

Description	The design and implementation of coordinated land use and coastal management plans that allocate suitable space for climate smart and sustainable aquaculture growth would be supported. The plans would identify sites for new aquaculture operations based on an assessment of the selected site's compatibility with other activities in the production landscape or seascape (e.g. to lower conflicts with miscellaneous users in inshore sheltered areas) and environmental risks (e.g. eutrophication, the effects on the wild population through escapees and eventual introduction of alien species). The design of the plans would be supported through a simplification/streamlining of the administrative procedures under the national law. In addition, strategic planning and decision-making support systems and tools would be developed through the development of the integrated data management platform proposed under Intervention B.4. The databases integrated in this platform would be used for climate change impact assessments, analysis of yield gaps, and explaining adaptation behaviors to climate change. By doing so, the platform could, for example, be instrumental to strategic cross-border planning and modeling for the development of freshwater aquaculture under the impact of climate change. Crucially, financial and technical support would be provided for actions implemented by producers in the context of coordinated land use and coastal management plans, in particular those that help introduce climate smart and sustainable aquaculture systems and solutions, high quality environmental feed, and improved feed management practices (see also interventions A.1., B.1., B.2). For example, maricultural production system may be enhanced by support for the combination of recirculating production systems for the prolonged rearing of juveniles, and offshore and semi-offshore technologies for market size fish production. Such a production systems would improve both the economic and environmental performance of marine cage aquaculture production. The introduction of efficient and sustainable innovations would also be supported through cooperation mechanisms that bring together researchers, policy makers and aquaculture sector stakeholders (see also Intervention E.4) and improved systems for delivering knowledge and information to respond to stakeholder needs (see also Interventions E.2 and E.3.).
Primary Links to Critical Needs	• Improve compatibility between production systems and ecological zones characteristics • Improve environmental sustainability of aquaculture production practices • Improve the use and effectiveness of risk management instruments • Improve the functionality of agricultural land markets • Improve coordination and complementarity between interventions in rural and coastal areas, including basic services • Improve access to R&DI and uptake of knowledge and technology supporting decision-making and investments (including climate change and sustainability) (Cross-Cutting)

Responsible Agency/ies	Ministry of Agriculture, Ministry of Environmental Protection and Energy, Scientific Institutions
Funding Source(s)	EMFF (Art. 22, 27), National Budget, Horizon Europe
Targeted Actor(s)	Producers, Producer Groups, Civil Society Organizations, Counties, Municipalities, Scientific Institutions
Key Sub-Sector(s)	Not specified
Territorial Focus	Natura 2000
Thematic Priority/ies	Knowledge and Innovation, Sustainable Nutrient Management, Landscape Preservation, Integrated Landscape Management, Eco-System Conservation, Land Administration, Climate Adaptation

Intervention D.2. Connect the aquaculture sector to growth opportunities provided by sustainable and circular bio-economies

Description	The design and implementation of local development strategies that are focused on developing quality (rural/coastal) infrastructure and services to aquaculture businesses would be supported to promote local development, halt outmigration, and create new jobs (especially outside primary aquaculture production). In particular, technical and financial support would be provided for investments that enable the integration of aquaculture value chains and the establishment of linkages between the aquaculture sector and related sectors, in particular food processing, tourism, and sustainable and circular bio-economy value chains (see also Interventions A.3., C.1., D.3). Public investments thus supported would include the construction of supporting infrastructure for renewable energy grids, water supply, roads, NGA broadband network, and logistics. In addition, support would be provided to aquaculture producers and processors for investments in the production of renewable energy from aquaculture waste and the development of new products from processing aquaculture by-products (e.g. pet food). The local development strategies and associated investments would be coordinated primarily through the cooperation mechanism (LEADER) and aligned with regional and territorial development strategies developed for Croatia.
Primary Links to Critical Needs	• Improve coordination and complementarity between interventions in rural and coastal areas, including basic services • Improve public infrastructure for modernizing aquaculture production • Increase value added of aquaculture production • Improve environmental sustainability of aquaculture production practices • Improve entrepreneurial capacity and opportunities of aquaculture producers • Improve the enabling environment to respond to aquaculture product demands of consumers • Facilitate capital investment focused on technology and innovation (Cross-Cutting) • Improve access to R&DI and uptake of knowledge and technology supporting decision-making and investments (including climate and sustainability) (Cross-Cutting)
Responsible Agency/ies	Ministry of Agriculture, Ministry of Regional Development and EU Funds
Funding Source(s)	EMFF (Art. 26), ERDF, EAFRD, Horizon Europe, National Budget
Targeted Actor(s)	Producer Organization, Producers, Processors, Scientific Institutions, Counties, Municipalities, Civil Society Organizations, FLAGs
Key Sub-Sector(s)	Not specified
Territorial Focus	N/A
Thematic Priority/ies	Basic Infrastructure and Services, Competitiveness, Diversification, Bio-Economy, Knowledge and Innovation, Renewable Energy, Digitization, Waste Management, Water Quality

Intervention D.3. Promote food destination tourism

Description	Tourism products built around authentic culinary experiences would be integrated in the branding and marketing strategies of tourism destinations and their tourism partners to incentivize longer stays, more repeat visitation, and higher average visitor spending. Specific tourist destinations traditionally known for local aquaculture products and specialties would be identified and promoted (e.g. the Bay of Mali Ston as a "shellfish country" to be visited and for the sake of the millennial tradition of oyster farming). In this context, sophisticated (digital) content and storytelling would be developed that responds to the culinary tastes and preferences of strategic consumers segments. Concretely, the development of product offerings for food destination tourism would be supported through increased investments in (i) local, higher value-added products that meet the standards of public and/or private quality schemes, including those for origin, specialty, and organic products (see also Interventions A.3. and C.3.); (ii) local "farm to table" initiatives involving cooperation/productive partnerships between producers, tourist organizations, and restaurants (see also Intervention C.1.); (iii) improved market connectivity of rural and coastal areas (see also Intervention D.2.); and (iv) tailored vocational training programs (see also Intervention E.3). This investment would be complemented by the organization of food expos/workshops and promotions/campaigns of local specialty products and traditional way of preparation of locally farmed species in cooperation with restaurants and caterers. This intervention would target in particular women who have a competitive advantage in the food and hospitality sector as producers of authentic regional cuisine and developers of homestays that will allow the additional income to remain within rural communities.
Primary Links to Critical Needs	• Improve entrepreneurial capacity and opportunities of aquaculture producers • Increase value added of aquaculture production • Improve the uptake of public and private quality schemes • Improve coordination and complementarity between interventions in rural and coastal areas, including basic services
Responsible Agency/ies	Ministry of Agriculture, Ministry of Tourism
Funding Source(s)	EMFF (Art. 24), National Budget
Targeted Actor(s)	Producers, Producer Organizations, Hospitality Services, Tourism Operators, Consumers, Women
Key Sub-Sector(s)	Not specified
Territorial Focus	N/A
Thematic Priority/ies	Sales and Marketing, Producer Organization, Gastro-tourism, Quality Schemes, Diversification

ACTION E.

Foster strong and integrated support systems for knowledge-based aquaculture development and innovation

SPECIFIC INTERVENTIONS
E.1. Research key issues affecting the production and marketing of aquaculture products in Croatia
E.2. Develop a Central Aquaculture Information System and Knowledge Hub
E.3. Strengthen educational and vocational training programs in the field of aquaculture, particularly for young people and women
E.4. Encourage innovation partnerships between producers and scientific institutions

Intervention E.1. Research key issues affecting the production and marketing of aquaculture products in Croatia

Description	The implementation of a number of strategic research projects would be supported. First of all, relevant institutions and experts would be identified for the evaluation of present and newly considered technologies and innovations, including profitability of different production systems, taking into consideration capital investments and cost of production, to better understand their potential and constraints (see also intervention A.1.). Secondly, growth rates of cultivated organisms in different seasons would be followed and compared with the available data on breeding. Monitoring would also include general demeanor, especially health status and feeding behavior of culturing organisms, and their eventual adaptation to climate change. The insights thus gained would guide the introduction of new management practices in relation to changes of relevant aquaculture parameters due to climate changes. Thirdly, data on the consumption of seafood and aquaculture products would be collected and marketing analyses would be conducted in collaboration with schools and universities. The analyses would focus in particular on tourism destinations and fish markets in major cities and would require close collaboration with local farmers, tourism organizations, major fish markets, and supermarket chains. Finally, communication channels between all players in the aquaculture value chain would be assessed, especially communication between producers and marketers that are close to the end users. The creation of efficient communication channels between these players is fundamental to securing prompt answers to existing and new product as well as opportunities for new product designs. Importantly, the data and results of these research project would be made available through the Central Aquaculture Information System and Knowledge Hub proposed under Intervention E.2.
Primary Links to Critical Needs	• Facilitate capital investment focused on technology and innovation (Cross-Cutting) • Improve access to R&DI and uptake of knowledge and technology supporting decision-making and investment (including climate and sustainability) (Cross-Cutting)
Responsible Agency/ies	Ministry of Agriculture
Funding Source(s)	EMFF (Art. 23), Horizon Europe, National Budget, EU-Technical Assistance
Targeted Actor(s)	Producers, Producer Groups, Processors, Distributors, Retailers, Tourism Operators, Hospitality Services, Scientific Institutions
Key Sub-Sector(s)	Not specified
Territorial Focus	N/A

Thematic Priority/ies	Competitiveness, Sales and Marketing, Climate Adaptation, Knowledge and Innovation, Aqua-Food Chain Integration

Intervention E.2. Develop a Central Aquaculture Information System and Knowledge Hub

Description	A Central Aquaculture Information System and Aquaculture Knowledge Hub would be established. The Knowledge Hub would bring together all publicly available data on Croatia's aquaculture sector, including technical and technological data, results from different research projects, and information on recent aquaculture development projects. It would also include the listing of relevant experts and institutions covering specific areas and providing specific technical assistance and organizational capacity-building services (e.g. evaluation of new technologies and innovations, business management, standards compliance, sales and marketing etc.) as well as general investment information and industry background for (women) entrepreneurs and young producers. The Knowledge Hub would form part of a new and integrated Central Agriculture Information System that encompasses all MoA databases and registries. The system would externally be presented as an interactive and user-friendly website supported by dedicated (mobile) applications.
Primary Links to Critical Needs	• Increase value added of aquaculture production • Improve environmental sustainability of aquaculture production practices • Improve compatibility between production systems and ecological zones characteristics • Improve the use of effectiveness of risk management instruments • Strengthen market linkages in the aquaculture sector, including supply aggregation • Improve the enabling environment to respond to aquaculture product demand of consumers • Improve the uptake of public and private agri-food quality schemes • Facilitate capital investment focused on technology and innovation (Cross-Cutting) • Improve access to R&DI and uptake of knowledge and technology supporting decision-making and investment (including climate and sustainability) (Cross-Cutting)
Responsible Agency/ies	Ministry of Agriculture
Funding Source(s)	EMFF (Art. 27), National Budget, EU-Technical Assistance
Targeted Actor(s)	Producers, Producer Groups, Investors, Paying Agency, Managing Authority, Monitoring Committee, Scientific Institutions, Inspection Services, Advisory Services
Key Sub-Sector(s)	Not specified
Territorial Focus	N/A
Thematic Priority/ies	E-Government, Knowledge and Innovation

Intervention E.3. Strengthen educational and vocational training programs in the field of aquaculture, particularly for young people and women

Description	Financial support would be provided for the development of educational and vocational training programs that are tailored to stakeholder needs, particularly young people and women. They would include the development of specific university programs that would bring new ideas and boost the interest of young people and women in the aquaculture sector. In addition, they would encompass different skills development initiatives that would be developed through strong engagement with public and private educational institutions, aquaculture producers, producer organizations, and aquaculture businesses. Initiatives would include short and work-based technical courses and target in particular small family farm workers (i.e. white fish, shellfish farms) as well as professional fishermen and women requiring retraining. The thematic focus of the courses would be on (i) post-harvest management (in particular for shellfish); (ii) application of digital skills in the environmental control of culturing environments – RAS; (iii) training for more service-oriented activities in the tourism sector; (iv) business management; as well as (v) environmental management/aquaculture sustainability.

Primary Links to Critical Needs	• Improve labor skills in the aquaculture chain • Increase value added of aquaculture production • Improve the uptake of public and private quality schemes
Responsible Agency/ies	Ministry of Agriculture, Ministry of Science and Education, Scientific Institutions
Funding Source(s)	EMFF (Art. 23, 24, 26), ESF+, National Budget
Targeted Actor(s)	Producers, Producer Organizations, Workers, Youth, Women
Key Sub-Sector(s)	Not specified
Territorial Focus	N/A
Thematic Priority/ies	Knowledge and Innovation, Competitiveness, Business Management, Post-Harvest Management, Financial Literacy/Accounting, Digitization, Precision Aquaculture, Gastro-Tourism, Sustainable Aquaculture, Gender, Youth

Intervention E.4. Encourage innovation partnerships between producers and scientific institutions

Description	Institutions and decision-making bodies would be established to strategically plan, evaluate and facilitate aquaculture technology and research projects. In particular, an Aquaculture Innovation/Industry Council would be created, which is made up of representatives of all aquaculture sub-sectors and encompasses producer, scientific and public organizations, with a view to apply technology foresight and encourage the definition of narrower thematic R&D areas for the industry as well for the scientific community. In addition, financial support would be provided to public-private innovation partnerships involving producers and scientific institutions through frequent thematic calls for proposals The support thus provided would focus on facilitating investment in applied research and development supporting the introduction of new technologies and species. Priority areas identified for technological development under the future NSPAD include (i) combined RAS and marine farming systems; (ii) controlled bio-secure systems for cultivating alien species with good growth potential (i.e. pangasius, salmon, tilapia, white shrimp); (iii) breeding technologies for new species and species already in the research stage (i.e. flat fish, amberjack, dentex); (iv) new technologies (RAS) in intensive farming of high value freshwater species, which are already present in cyprinid ponds and grown in low quantities (i.e. pike perch, perch, European catfish). On the other hand, a priority area for new species includes the establishment of breeding programs for disease resistance and selective breeding to improve adaptation to changing environmental conditions. This list of priority areas could be further expanded based on the decisions made by the Aquaculture Innovation/Industry Council. Importantly, the dissemination of the research and development results achieved by the innovation partnerships would be facilitated through the proposed Knowledge Hub (see also Intervention E.2.). Finally, the support for innovation partnerships would be complemented by a voucher program for advisors to facilitate innovation capacities of producers and processors, technology transfer, and access public funding provided under different EU support programs for (bio-economy) research and innovation projects.
Primary Links to Critical Needs	• Improve access to R&DI and uptake of knowledge and technology supporting decision-making and investments (including climate and sustainability) (Cross-Cutting) • Facilitate capital investment focused on technology and innovation (Cross-Cutting) • Improve the environmental sustainability of aquaculture production practices • Improve the compatibility between production systems and ecological zones characteristics • Increase value added of aquaculture production
Responsible Agency/ies	Ministry of Agriculture, Ministry of Science and Education, Ministry of Economy, Entrepreneurship and Crafts
Funding Source(s)	EMFF (Art. 23), ERDF, Horizon Europe, National Budget
Targeted Actor(s)	Producers, Producer Organizations, Scientific Institutions, Advisory Services

Key Sub-Sector(s)	Not specified
Territorial Focus	N/A
Thematic Priority/ies	Knowledge and Innovation, Competitiveness, Climate Adaptation, Diversification, Fish Health & Welfare

6. Linking the Interventions to Specific Measures for Key Sub-Sectors

The interventions under the proposed roadmap will translate into the implementation of specific measures for key sub-sectors targeted under the future NSPAD. Under the STARS RAS, a market analysis of Croatian aquaculture and fisheries was completed, which identified the key assets, constraints, (market) potentials and risks that characterize key aquaculture sub-sectors in Croatia. Annex II – VI summarize the outcome of this analysis for the sub-sectors that were selected in consultation with the Directorate of Fisheries of the MoA. They encompass the white fish, tuna, shellfish, warm freshwater fish, cold freshwater fish, and Recirculating Aquaculture System (RAS) farming sub-sectors. The tables below provide an overview of the specific measures proposed for each of these sub-sectors for the future NSPAD on the basis of the analysis completed under the STARS RAS. In addition, the tables specify the relevant link to the aquaculture sector-wide interventions outlined in Section 5.

WHITE FISH FARMING

Intervention	Specific Sub-Sector Measure
A.1.	• Increase investments in climate-smart and environmentally sustainable assets, technologies and solutions by both small-, medium-, and large-scale producers, including investments in operations such as hatcheries and fingerlings production, genetic selection to improve growth and disease resistance, and adequate fish feed manufacturing plants • Support the use of land-based, closed cycle recirculating aquaculture systems (RAS), including flat-tank systems for flatfish
A.2.	• Adopt specific measures to increase the production capacities with higher profit, including financial incentives to encourage the merging of small and part-time growers • Attract more investment into existing and new ventures targeting the premium and niche market segments (e.g. organic) inside and outside of Croatia, especially for seabass and sea bream
A.3.	• Establish incentives for investments in the introduction of new species that are available for mariculture development, such as Dentex, Seriola, flatfish and salmonids • Support product diversification and new product promotion, especially for sea bass, sea bream and meagre, which are currently in the initial stages of development (e.g. fish to portions, ready to cook, take-away and ready to eat)
B.1.	• Increase support to small-, medium-, and large-scale producers that adopt efficient health management practices, in particular disease prevention measures (including the use of immune stimulants and other measures that will increase immunity, either specific or non-specific), limiting the use of antibiotics and other veterinary medicines • Support projects and producers that work on technical and technological solutions on climate change adaptation
B.2.	• Develop adequate emergency response mechanisms in case of disease outbreak or invasive species on farms
B.3.	• Design financial and risk management instruments that facilitate access to commercial credit and insurance for small and medium-sized white fish producers
C.1.	• The activities of smaller sea bass/sea bream producers who offer cleaning and filleting fish for restaurants and hotels during tourist season should be enhanced by supporting investments in a common larger processing facility as well as adequate logistic for moving products to the resorts, hotels, as well as selected markets in major cities
C.2.	• Encourage small-scale producers to collaborate more with each other and other stakeholders to improve their efficiency and strengthen their marketing inside and outside the country
C.3.	• Support the participation of small-, medium-, and large-scale producers in quality schemes, including organic, specialty products, and voluntary certification schemes
D.1.	• Implement coordinated spatial planning and integration of aquacultural activities into the coastal management plan to ensure the availability of aquaculture locations and mitigate potential threat from competitive users for waterfront and ocean resources
D.2.	• Initiate the development of a safe disposal or recycling scheme for used styrene cases and trays
D.3.	• Support marketing campaigns organized around fish mariculture as part of food tourism destination initiatives
E.1.	• Finance research on impacts of warming of the Adriatic Sea on the production of white fish species
E.2.	• Scale up breeding/animal selection and feed quality programs through the organization of (re-)production clusters and innovation partnerships involving producers and scientific institutions

TUNA FARMING

Intervention	Specific Sub-Sector Measure
A.1.	• Increase investments in climate-smart and environmentally sustainable assets, technologies and solutions by large-scale producers, including investments in sustainable waste management solution, feeding techniques and pollution control measures
D.1.	• Research impacts of long-term climate change warming on tuna farming areas
D.3.	• Research options to promote Croatian tuna products in restaurants
E.4.	• Support collaborative R&D to develop larval rearing technologies

SHELLFISH

Intervention	Specific Sub-Sector Measure
A.1.	• Incentivize investments in new technologies and practices, including in shellfish hatcheries, purification systems, waste management (e.g. disposal of empty shell material and other waste)
A.2.	• Support investments in increased production capacities with higher profit, including financial incentives to encourage the merging of small part-time growers • Develop a feasibility study on the costs-benefits of establishing a shellfish hatchery in Croatia
A.3.	• Support investments in product differentiation (e.g. certification: Bay of Mali Ston - oyster, Novigrad sea - mussels), new species diversification through hatchery technology (e.g. scallops), and value addition • Stimulate the high value natural/organic market segment development
B.2.	• Develop and implement a socially, ecologically or economically sustainable solution to the predatory fish problem for the shellfish industry that goes beyond regular predation compensation payments
C.1.	• Support the development of market studies and stimulate partnerships with buyers on foreign markets • Stimulate productive partnerships between producers, supermarkets, and/or vertically integrated large-scale enterprises with modern technologies producing a wide range of products, including a long-life consumer pack of ready-to-heat-and-eat shellfish
C.2.	• Encourage small-scale producers to collaborate more with each other and other stakeholders in the value chain to improve their efficiency and strengthen their marketing inside and outside the country
C.4.	• Implement Study Travel Scholarships for young entrepreneurs and those interested in retraining to facilitate the transfer knowledge about the latest technology and best practices in shellfish production, processing and marketing
D.1.	• Support improved local development planning and investments to improve sewage infrastructure systems affecting growing areas
D.3.	• Promote and support active and sophisticated shellfish industry-related food tourism destination ideas, including waterfront fine-dining (where permitted)
E.3.	• Support initiatives for skills improvement of post-harvest actors in the distribution chain for shellfish
E.4.	• Support collaborative R&D to develop shellfish hatchery technology

WARM FRESHWATER FARMING

Intervention	Specific Sub-Sector Measure
A.1.	• Support investments in more intensive approaches, mechanization and modern technology (like RAS) to help improve efficiency and economies of scale and take advantage of the strong domestic and foreign demand for the warm water fish including the common carp • Support business diversification of pond-based producers with recreational, tourism and educational activities
A.2.	• Support investments in better feeding regimes and intensive cultures
A.3.	• Support investments in the cultivation of commercially interesting freshwater fish species (e.g. pike perch), now grown only in ponds with cyprinids, in intensive monoculture (RAS) • Support the diversification of production of commercially interesting species (eg. pike perch, European catfish) for the domestic and export markets • Support investments in a freshwater fish hatchery to overcome the long-standing need with existing farmed species and to pursue R&D with new species such as pike perch (with large fillet) and starlet sturgeon (large fillets, caviar and tourism opportunities) • Support new product development with more convenient products (e.g. ready to eat) and smart retail packaging and promotion
B.1.	• Increase support to small-, medium-, and large-scale producers that adopt efficient health management practices, in particular disease prevention measures (including the use of immune stimulants and other measures that will increase immunity, either specific or non-specific), limiting the use of antibiotics and other veterinary medicines, and climate change adaptation
B.4.	• Improve freshwater aquaculture databases, including data on production, technology adoption, pond infrastructure, climate and water supply
C.1.	• Implement specific educational and promotional activity in Zagreb and coastal areas to improve consumers' perception and consumption of the warmwater fish
C.2.	• Encourage small-scale producers to collaborate more with each other and other stakeholders in the value chain to improve their efficiency and strengthen their marketing inside and outside the country
D.1.	• Develop, implement and monitor comprehensive management plans for freshwater aquaculture with a view to ensure production in the event of droughts or floods, while managing trade-offs between production, nature protection, and climate change adaptation
D.3.	• Implement targeted promotional actions linked to the growing influx of Asian tourists (who are fond of carp and love eating experiences) by sharing the story of Croatian carp and dishes • Support the development of farm-related, experiential tourism and souvenirs for tourists

COLD FRESHWATER FARMING

Intervention	Specific Sub-Sector Measure
A.1.	• Support investments in more intensive approaches, mechanization and modern technologies for flow-through system production • Support investments in the renovation and commissioning of existing, but unused trout production resources • Support investments in RAS technology for trout and for alien cold water species
A.3.	• Support the development of and investments in new products and market diversification (e.g. trout reared in salt water cages or marine RAS systems) • Support investments in value adding and processing activities (e.g. smoked trout) • Support investment in a freshwater fish hatchery and feed pellets production
B.2.	• Install support mechanisms for the compensation of predator damages on cold water farms
D.1.	• Research impacts of long-term climate change warming on cold water fish production

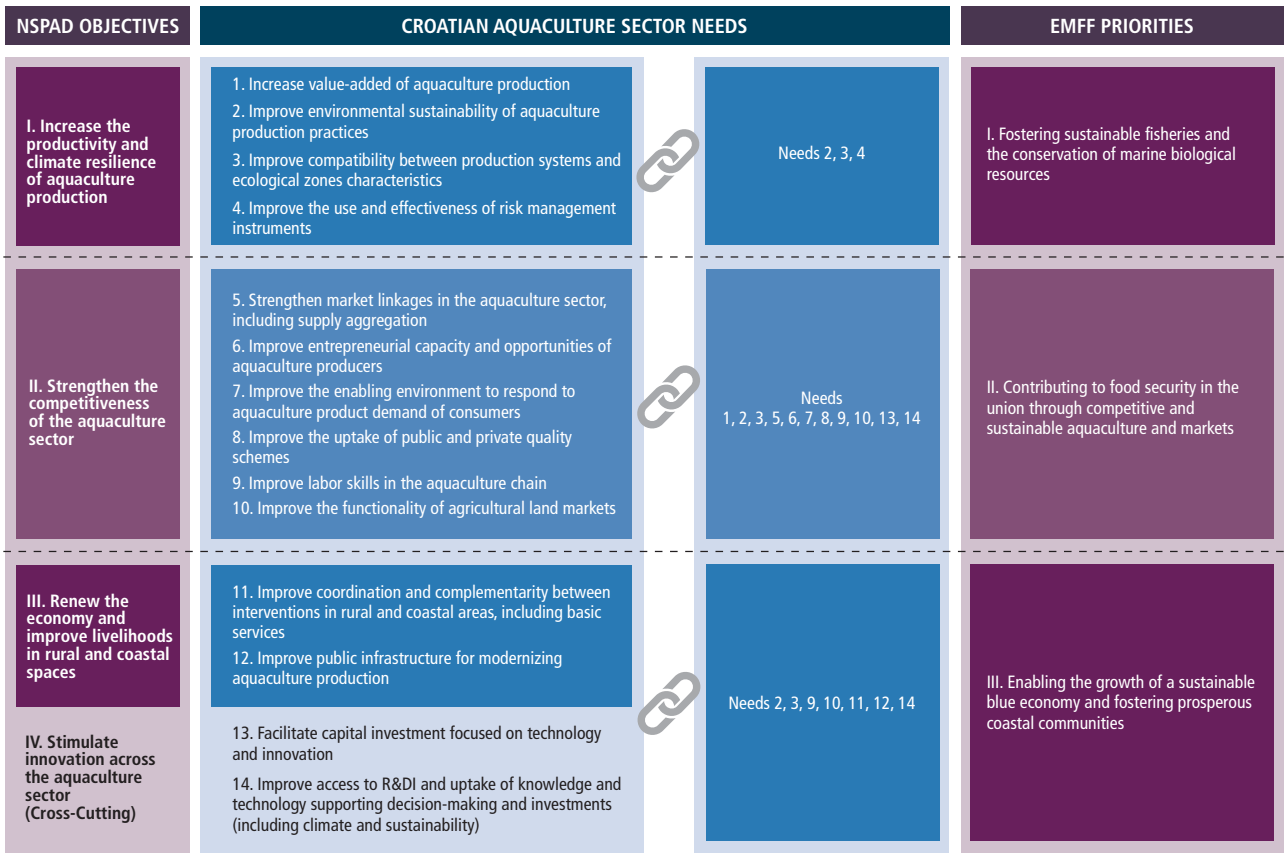
RECIRCULATING AQUACULTURE (RAS)

Intervention	Specific Sub-Sector Measure
A.1.	• Support entrepreneurs who are willing to invest in environmentally sustainable intensification of aquaculture production systems (RAS, IMTA, CIE systems, aquaponics), including through the integration of digital technologies. • Support investments in synergistic aquaculture and agriculture operations that would include RAS fish production, agriculture and aquaculture waste and waste water mitigation, as well as biogas production based on aquaculture production and processing and the utilization of agriculture waste • Support the relocation of existing production sites to closed systems using new technologies (e.g. part of the carp production cycle)
A.2.	• Promote RAS to potential investors and support the development of feasibility studies
B.1.	• Define and support the adoption of good health management practices for RAS production systems
C.1.	• Promote RAS' predictable harvest and year-round availability of product as a tool to penetrate strategic market segments
C.4.	• Present RAS production system as a bankable business model
E.3.	• Support skills development initiatives focused on the application of digital skills in the environmental control of culturing environments – RAS

7. Linking the NSPAD to the New Operational Program for the EMFF

The critical needs of Croatia's aquaculture sector will form the primary link between the future NSPAD and the EMFF Operational Program. The proposed roadmap for the future NSPAD laid out in Section V is based on the Croatian aquaculture sector's critical needs as well as the objectives identified in the Strategic Vision proposal developed under the STARS RAS Project. As part of this strategic visioning process, the relevant links between the aquaculture sector's critical needs and the EMFF Priorities were also considered as part of the priority-setting and theory of change methods that underpinned the stakeholder consultation efforts under the STARS RAS Project. Figure 2 below provides an overview of the links between the fourteen (14) critical needs and the NSPAD and EMFF Priorities respectively. Once official agreement is reached on the Common Monitoring and Evaluation System (CMES) for the post-2020 EMFF, expected outputs and results, including relevant performance indicators, will have to be defined for each measure included in the new Operational Program for the EMFF, which would be developed on the basis of the future NSPAD. The implementation arrangements for each performance indicators would be defined in the Indicator Fiches provided by the European Commission.

Figure 2. Links between Croatian aquaculture sector needs and the objectives proposed for the future NSPAD and EMFF



8. Results Monitoring Framework

The results monitoring framework for the future NSPAD would be organized around a standardized set of performance indicators. The implementation performance of the future NSPAD would be monitored at the level of the strategic and specific objectives as well as the critical needs identified for the strategy. Existing performance indicators that have been standardized either at the EU level (as part of the Regulation on the European Maritime and Fisheries Fund) or the national level (as part of the National Development Strategy) would be integrated in the results monitoring framework. The tables below provide an overview of the proposed framework using existing sets of performance indicators. Once the results monitoring framework of the future EMFF and National Development Strategy have been formally adopted, the proposed framework will need to be revised accordingly. In addition, baselines, milestones, and targets will need to be established for each performance indicator retained in the framework.

Strategic Objective Indicators

Indicator Name	Reference/Source	Link(s) to EMFF Objectives
1. Increase the Productivity and Climate Resilience of Aquaculture Production		I, II, III
Resource Productivity and Domestic Material Consumption	EUROSTAT-SDG	
2. Strengthen the Competitiveness of the Aquaculture Sector		II, III
Ease of Doing Business Index	WB	
The educational structure of employees in the food and bio-economy sectors	CBS	
Share of food processing, wood processing and bio-products in GDP and Total Export	CBS	
3. Renew the Economy and Improving Livelihoods in Rural and Coastal Spaces		III
Evolution of GDP in maritime NUTS 3 regions	EU EMFF	
Turnover of the bio-economy sector as percent of GDP	JRC-DataM	
Evolution in the number of jobs (in FTE) in the sustainable blue economy	EU EMFF	
4. Stimulate Innovation across the Aquaculture Sector		Cross-Cutting
European Innovation Scoreboard	EIS	

Specific Objective Indicators		
Indicator Name	**Reference/Source**	**Link(s) to Critical Needs**
1.1. Increase Farm Efficiency and Value Addition		1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 14
Agriculture, Forestry, and Fishing Value Added	CBS	
1.2. Improve the Sustainable Management of Natural Resources		6, 7, 8, 9, 11, 12, 14
Surface (ha) of Natura 2000 sites, and other MPAs under the MSFD, covered by protection, maintenance and restoration measures	EUROSTAT	
1.3. Reduce Climate Change Vulnerabilities and Promote Low Emissions Production		1, 6, 7, 8, 11, 12, 13, 14
Energy consumption (in aquaculture/in processing) leading to CO2 emissions reduction - kWh/tonne	EU EMFF	
2.1. Expand Markets for Croatian Aquaculture Products		2, 3, 4, 5, 12
Food Trade Imports and Exports	COMTRADE	
2.2. Integrate MSMEs and Young Producers in Aquaculture Value Chains		1, 2, 3, 4, 7, 9, 12, 14
Number of new SMEs per year (in the aquaculture sector)	CBS	
2.3. Facilitate Producer Access to Strategic Market Segments		2, 3, 4, 7, 8, 9, 12, 14
Food Trade Imports and Exports	COMTRADE	
3.1. Generate More and Better Jobs in Rural and Coastal Areas		1, 2, 3, 4, 7, 8, 10, 12, 14
Employment in Fisheries Sector	EUROSTAT	
Share of people employed in the food industry and bio-economy	CBS	
Number of women whose livelihoods and incomes were improved.	WB	
3.2. Support the Transition to a Smart and Green Rural and Coastal Economy		1, 2, 4, 7, 8, 9, 10, 11, 12
Increase the output of the food and bio-economy sectors	CBS	
4.1. Mobilize more public and private investments in RDI in aquaculture as well as rural and coastal businesses		1, 2, 3, 6, 7, 8, 9, 10, 12
Expenditure on research and development, by sectors of performance	CBS-EUROSTAT	
4.2. Improve technology transfer to aquaculture farms and businesses, as well as other sectors and the rural and coastal population		1, 2, 7, 12
Cooperation activities between stakeholders	EU EMFF	

Intermediate Results Indicators by Critical Need		
Indicator Name	**Reference/Source**	**Link(s) to Interventions**
Critical Need 1. Increase value-added of aquaculture production		A.1, A.3, B.1, C.1, C.2, C.3, D.2, D.3, E.2, E.3, E.4
Volume of aquaculture production/processing	EU EMFF	
Value of aquaculture production/processing	EU EMFF	
Production capacity (aquaculture/processing)	EU EMFF	
Businesses with higher turnover	EU EMFF	
Critical Need 2. Improve environmental sustainability of aquaculture production practices		A.1, B1, B.2, B.4, C.1, C.3, D.1, D.2, E.2, E.4
Entities improving resource efficiency in production and/or processing	EU EMFF	
Organic production of animal products	EUROSTAT	
Critical Need 3. Improve compatibility between production systems and ecological zone characteristics		B.2, B.4, D.1, E.2, E.4
Area addressed by operations protecting , conserving, and restoring biodiversity and ecosystems	EU EMFF	
Actions addressing nature restoration, conservation, protection of ecosystems, biodiversity, health and welfare	EU EMFF	
Critical Need 4. Improve the use and effectiveness of risk management instruments		A.1, B.1, B.2, B.3, B.4, C.1, C.2, C.4, D.1, E.2
Share of farms with risk management tools	EU PMEF-CAP	
Critical Need 5. Strengthen market linkages in the aquaculture sector, including supply aggregation		A.1, A.2, A.3, C.1, C.2, C.3, E.2
Cooperation activities between stakeholders	EU EMFF	
Entities benefiting from promotion and information activities	EU EMFF	
Share of farmers participating in supported Producer Groups, Producer Organizations, local markets, short supply chain circuits and quality schemes	EU PMEF-CAP	
Share of value of marketed production by Producer Organizations with Operational Programs	EU PMEF-CAP	
Critical Need 6. Improve entrepreneurial capacity and opportunities of aquaculture producers		A.2, B.3, C.1, C.2, C.3, C.4, D.2, D.3
Number of existing women producers and entrepreneurs supported (for market linkages, access to strategic value chains, access to finance, business development support	WB	
Number of new women producers and entrepreneurs supported to access markets, finance, skills, business development support services	WB	
Businesses created	EU EMFF	
Datasets and advice made available	EU EMFF	
Investment induced	EU EMFF	
Jobs created (FTE) in supported projects	EU EMFF	
Jobs maintained (FTE) in supported projects	EU EMFF	

Critical Need 7. Improve the enabling environment to respond to aquaculture product demands of consumers		**B.3, C.1, C.2, C.3, C.4, D.2, E.2**
Procedures, time and cost to complete all formalities to build a warehouse and the quality control and safety mechanisms in the construction permitting system (Ease of Doing Business)	WB	
Logistics Performance Index	WB	
Critical Need 8. Improve the uptake of public and private quality schemes		**A.1, B.1, C.1, C.2, C.3, D.3, E.2, E.3**
Change in the volume of aquaculture production certified under voluntary sustainability schemes	EU EMFF 14-20	
Critical Need 9. Improve labor skills in the aquaculture chain		**C.1, C.3, E.3**
Persons benefiting from training	EU EMFF	
Number of women workers whose skills were enhanced	WB	
Entities increasing social sustainability	EU EMFF	
Participation rate of youth and adults in formal and non-formal education and training in the last 12 months	CBS-SDG	
Critical Need 10. Improve the functionality of agricultural land markets		**B.4, D.1**
Procedures, time and cost to transfer a property and the quality of the land administration system (Ease of Doing Business)	WB	
Critical Need 11. Improve coordination and complementarity between interventions in rural and coastal areas, including basic services		**D.2, D.3, E.3**
Number of women supported to link to agri-food tourism value chains	WB	
Critical Need 12. Improve public infrastructure for modernizing aquaculture production		**D.2**
Investment induced	EU EMFF	
Critical Need 13. Facilitate capital investment focused on technology and innovation (Cross-Cutting)		**A.1, A.2, A.3, B.3, C.1, C.3, C.4, D.2, E.1, E.2, E.3, E.4**
Innovations enabled	EU EMFF	
Critical Need 14. Improve access to R&DI and uptake of knowledge and technology supporting decision-making and investments (including climate and sustainability) (Cross-Cutting)		**B.1, B.4, C.1, C.2, C.3, D.1, D.2, E.1, E.2, E.3, E.4**
Effectiveness of the system for "collection, management and use of data" in the required quality	EU EMFF	
Actions to improve governance capacity	EU EMFF	

9. Annexes

Annex I: Linkages between Interventions, Critical Needs, and Strategic Objectives

Specific Interventions	I. INCREASE THE PRODUCTIVITY AND CLIMATE RESILIENCE OF AQUACULTURE PRODUCTION			
	Critical Needs			
	1. Increase value added of aquaculture production	2. Improve environmental sustainability of aquaculture production practices	3. Improve compatibility between production systems and ecological zone characteristics	4. Improve the use and effectiveness of risk management instruments
A.1. Incentivize more investments in efficient and sustainable aquaculture technologies and solutions	●	●		●
A.3. Stimulate the development of new aquaculture products with higher added value	●			
B.1. Promote the application of efficient health management practices	●	●		●
B.2. Improve habitat and predator management on aquaculture farms		●	●	●
B.3. Develop relevant risk management instruments supporting sustainable aquaculture investments				●
B.4. Improve access to climate and environmental data for public and private aquaculture sector stakeholders		●	●	●
C.1. Stimulate productive partnerships between aquaculture producers and buyers	●	●		●
C.2. Strengthen and encourage producer organizations	●			●
C.3. Improve support mechanisms for producers to comply with public and private food safety and quality standards	●	●		
C.4. Support innovative women, youth and entrepreneurs in starting new aquaculture businesses				●
D.1. Reconcile sustainable aquaculture development with nature protection and climate change adaptation		●	●	●
D.2. Connect the aquaculture sector to growth opportunities provided by circular bio-economies	●	●		
D.3. Promote food destination tourism	●			
E.2. Develop a Central Aquaculture Information System and Knowledge Hub	●	●	●	●
E.3. Strengthen educational and vocational training programs in the field of aquaculture, particularly for young people and women	●			
E.4. Encourage innovation partnerships between producers and scientific institutions	●	●	●	

	II. STRENGTHEN THE COMPETITIVENESS OF THE AQUACULTURE SECTOR					
	Critical Needs					
Specific Interventions	**5. Strengthen market linkages in the aquaculture sector, including supply aggregation**	**6. Improve entrepreneurial capacity and opportunities of aquaculture producers**	**7. Improve the enabling environment to respond to aquaculture product demand of consumers**	**8. Improve the uptake of public and private quality schemes**	**9. Improve labor skills in the aquaculture chain**	**10. Improve the functionality of agricultural land markets**
A.1. Incentivize more investments in efficient and sustainable aquaculture technologies and solutions	●			●		
A.2. Support investment in larger production capacities with higher profit capabilities	●	●				
A.3. Stimulate the development of new aquaculture products with higher added value	●					
B.1. Promote the application of efficient health management practices				●		
B.3. Develop relevant risk management instruments supporting sustainable aquaculture investments		●	●			
B.4. Improve access to climate and environmental data for public and private aquaculture sector stakeholders						●
C.1. Stimulate productive partnerships between aquaculture producers and buyers	●	●	●	●	●	
C.2. Strengthen and encourage producer organizations	●	●	●	●		
C.3. Improve support mechanisms for producers to comply with public and private food safety and quality standards	●	●	●	●	●	
C.4. Support innovative women, youth and entrepreneurs in starting new aquaculture businesses		●	●			
D.1. Reconcile sustainable aquaculture development with nature protection and climate change adaptation						●
D.2. Connect the aquaculture sector to growth opportunities provided by circular bio-economies		●	●			
D.3. Promote food destination tourism		●		●		
E.2. Develop a Central Aquaculture Information System and Knowledge Hub	●		●	●		
E.3. Strengthen educational and vocational training programs in the field of aquaculture, particularly for young people and women				●	●	

	III. RENEW THE ECONOMY AND IMPROVE LIVELIHOODS IN RURAL AND COASTAL SPACES	
	Critical Needs	
Specific Interventions	**11. Improve coordination and complementarity between interventions in rural and coastal areas, including basic services**	**12. Improve public infrastructure for modernizing aquaculture production**
D.2. Connect the aquaculture sector to growth opportunities provided by circular bio-economies	●	●
D.3. Promote food destination tourism	●	
E.3. Strengthen educational and vocational training programs in the field of aquaculture, particularly for young people and women	●	

	IV. STIMULATE INNOVATION ACROSS THE AQUACULTURE SECTOR	
	Critical Needs	
Specific Interventions	**13. Facilitate capital investment focused on technology and innovation (cross-cutting)**	**14. Improve access to R&DI and uptake of knowledge and technology supporting decision-making and investments (including climate and sustainability) (cross-cutting)**
A.1. Incentivize more investments in efficient and sustainable aquaculture technologies and solutions	●	
A.2. Support investment in larger production capacities with higher profit capabilities	●	
A.3. Stimulate the development of new aquaculture products with higher added value	●	
B.1. Promote the application of efficient health management practices		●
B.3. Develop relevant risk management instruments supporting sustainable aquaculture investments	●	
B.4. Improve access to climate and environmental data for public and private aquaculture sector stakeholders		●
C.1. Stimulate productive partnerships between aquaculture producers and buyers	●	●
C.2. Strengthen and encourage producer organizations		●
C.3. Improve support mechanisms for producers to comply with public and private food safety and quality standards	●	●
C.4. Support innovative women, youth and entrepreneurs in starting new aquaculture businesses	●	
D.1. Reconcile sustainable aquaculture development with nature protection and climate change adaptation		●
D.2. Connect the aquaculture sector to growth opportunities provided by circular bio-economies	●	●
E.1. Research key issues affecting the production and marketing of aquaculture products in Croatia	●	●
E.2. Develop a Central Aquaculture Information System and Knowledge Hub	●	●
E.3. Strengthen educational and vocational training programs in the field of aquaculture, particularly for young people and women	●	●
E.4. Encourage innovation partnerships between producers and scientific institutions	●	●

Annex II: White Fish Sub-Sector Analysis

Assets

- There are companies in Croatia leading with innovation, modern production and post-harvest technology and strategic marketing. Market leader "Cromaris" has built a great reputation globally for Croatian mariculture and demonstrated the industry's economic and social value to the Croatian people
- Demographic outlook for staffing is good with younger people entering the industry
- Community and regional political attitudes to cage culture is positive
- The acceptance and consumption of white farmed fish is raising in Croatia
- Croatian farmed seabass and sea bream are reared to deliver superior flesh texture and taste and are increasingly being accepted as very good, equal to or better than the wild fish in Croatia and recognized abroad
- Initial development work and market promotion of several white farmed fish products has been initiated

Constraints

- Heavy reliance on foreign feed mill and hatcheries
- Little specialization in production technology: lacking in genetic selection and use of RAS systems
- Most farmers are small scale with low financial investment, little personal dedication and relatively high costs
- Small part time growers in the black market undermine orderly marketing and damage community support and the reputation of mariculture
- Insufficient adoption of modern technology, much of which is accessible at no cost
- Most people in the industry, outside the supermarket trade, are not in tune with increasing community concerns about sustainable seafood production
- Small scale growers do not recognize the value of greater collaboration with research community, government agencies and their peers
- Only the largest companies are making use of World Wide Web and social media for company or industry publicity and product promotion
- Croatia has no mechanism for recycling Styrene cases in an environmentally satisfactory manner

Potentials

- Croatian wild catch of seabass, sea bream and hama is negligible, providing an ample room for marketing of farmed fish
- Scope for growth in premium and niche market (e.g. organic) segments inside and out of Croatia for seabass and sea bream
- Market outlook for meagre fish, portions and other products is very good
- "New" species available for mariculture development: Dentex, Seriola and salmonids
- Global trend from fish to portions, ready to cook, take-away ready to eat (value added) products widens and strengthens employment opportunities
- Tourism potential of white fish mariculture essentially remains barely touched
- Development of safe utilization or recycling scheme for used styrene cases and trays

Risks

- Significant warming of the Adriatic Sea represents a long-term threat to the production of some species (and represents an opportunity for others)
- Disease outbreak or invasive species in farms coupled with inadequate emergency response mechanism
- Potential threat from competitive users for waterfront and ocean resources
- Potential problems with aggressive animal welfare activists taking a very narrow view of caged fish
- Price competition from foreign producers entering the premium sector of white fish farming and the organic segment
- Predatory dolphin presents a problem that also damage the cages as well as the bluefish, Pomatomus saltatrix) in the Lim fjord
- There is a potential threat to white fish sales from plant based "seafood products" currently making strong inroads as alternatives to animal flesh foods in the USA grocery chains such as Walmart

Annex III: Tuna Farming Sub-Sector Analysis

Assets

- Demand is strong for in Japan where almost all of Croatian tuna is sold
- There is additional market in EU, including Croatia
- Relatively high prices for final product keep the business model stable

Constraints

- Production strongly depends on tuna fishing quotas with no realistic significant expansion possibilities
- Feed and feeding on small pelagic fish causes pollution of the sea, especially grease that floats on the surface and creates conflict with the surrounding tourist areas
- Croatian tuna does not reach highest prices on Japanese market
- Production, sales and whole business model presently depend on one single market

Potentials

- Improve the quality and reach higher price s on Japanese market
- Explore EU markets and Croatian prime markets (high end customers, hotels and restaurants)
- Consider species diversification (e.g. Seriola) to expand production and create B-plan in the case of quota problems

Risks

- This industry sector is constrained by EU tuna fishing quotas
- Climate and temperature changes in the Adriatic could trigger changes in sea water temperature what is critical for temperature sensitive big pelagic fish

Annex IV: Shellfish Farming Sub-Sector Analysis

Assets

- Croatian demand for the two native species exceeds domestic supply and producers can regain domestic market share from imports
- Both species are grown commercially in both the north and south of Croatia. An advantageous distribution in times of accidental water pollution or climate change
- Croatia remains as one of the last sanctuary of European native flat oyster which, with appropriate marketing and promotion can be highly prized in France and elsewhere
- There are young entrepreneurs that could learn much about the latest technology and best practices in shellfish production, processing and marketing with Study Travel Scholarships

Constraints

- The industry is dominated by non-professional growers and outdated practices, undermining sector status and progress
- There is no commercial shellfish hatchery in Croatia
- Only live product is sold at the market; there is no product diversification or value addition
- Aging population and low profitability makes investment and recruitment problematic
- Some operators are careless with disposal of empty shell material and other waste, damaging sector image and community support
- Large quantities of biological fouling after cleaning the shells are thrown into the enclosed areas, which negatively affects the water quality and could limit production these areas
- There is little reliable data on Croatian production, economic performance and marketing of shellfish
- Compensation scheme sought for fish predation of shellfish could a negative influences on business behavior; and it is not socially, ecologically or economically sustainable

Potentials

- Sector revival through increasing volumes, better product quality, new convenient value-added products and market promotion, domestic and foreign
- Best practices and equipment can easily be adapted from overseas models or purchased; seek sponsorship for Study Travel Scholarships for young and those interested in retraining
- Vertically integrated large-scale enterprises with modern technology producing wide range of products, including a long-life consumer pack of ready-to-heat-and-eat shellfish
- Supermarket sector in Croatia is still essentially unserved with fresh domestic shellfish products and offers room for wider distribution and sales growth
- The high value natural/organic/eco-labelled shellfish segment can be tapped
- New species diversification through hatchery technology (e.g. scallops)
- Higher priced smarter, more sophisticated shellfish farming related to tourism experiences

Risks

- Climate changes, sewage, agricultural (pesticides) or industrial (persistent pollutants) pollution, rise of bio toxins and/or accidents in shellfish depuration leading to closure of farming areas or product recall and regional and national damaging publicity of the shellfish industry
- Exotic oyster species, Crassostra gigas invasion represents a real threat, especially in Istria
- New regulations regarding disposal or recycling of styrene cases
- Potential threat from competitive users for growing area in bays and waterfront developers objecting to increases in areas designated for shellfish culture

Annex V: Warm Water Fish Farming Sub-Sector Analysis

Assets

- Warm water farming region in Croatia is still remarkably pristine in nature
- Farming related tourism income in this region is a plus
- Still ample acreage available for expansion of commercial fish production
- Fish farming's long history has delivered a pool of skilled/ experienced workers
- Domestic and external demand often exceeding supply for key fish species
- Low price of carp flesh makes it a good raw material for new product development

Constraints

- Lack of formulated diets and fish hatchery, low intensity farming and a three-year growing cycle have constrained farm productivity and industry growth
- Weak marketing skills in small enterprises undermines prices for more skilled operators
- Widespread negative perceptions on freshwater farmed fish and minimal appreciation of warm water fish in coastal areas
- Weak biosecurity and capability in managing risk of disease (e.g. KHVD in carp)
- Demand is concentrated in two short periods of the year
- No targeted promotion of warm water fish, only generic promotion of (all) Croatian seafood
- Little interaction between small and medium enterprises and the public R&D providers
- Little collaboration and cooperation between the different enterprises in lowering costs and improving marketing

Potentials

- Greater investment in better feeding regime, intensive culture, can raise carp productivity above 1 ton/ha
- Targeted promotion can raise sales of carp in current low consumption areas in Croatia
- Possible increased trade with CEFTA countries with fall in trade barriers
- New product development with more convenient ready to eat products and smart retail packing and promotion
- Catch limits on Croatia's wild fisheries enables aquaculture to fill the growing fish demand
- Organic/guilt free, ethical eating and other niche segments
- Target the growing Asian tourism: hundreds of millions of Asians are fond of carp and love eating experiences: share the Croatian dishes and the Croatian carp story
- Develop smarter farm related experiential tourism and souvenirs for Europeans and others, (not the common quick "look, buy and leave" visits)
- New species for future farming diversification such as pike perch (with large fillet) and starlet sturgeon (large fillets, caviar and tourism opportunities)

Risks

- Drought, low river levels damaging natural pond ecosystem, reducing farm productivity
- Cheap imports from nearby countries, placing downward pressure on prices
- Harmful algal blooms and diseases (indigenous and foreign introduction)
- Management of waterbirds and other animals may become more problematic and costly in Natura 2000 zones
- Further obligations and red tape on farms operating in ecologically sensitive regions

Annex VI: Cold Water Fish Farming Sub-Sector Analysis

Assets

- Cool clean pristine areas, some farms located not far from large population centers and strong farm gate sales
- Still ample room on farms for expansion of growing waters
- Expertise and skilled people are available for farm expansion
- Attractive plate fish that has relatively strong demand from all users
- Some interest in greater collaboration amongst growers

Constraints

- Aging demographic has apparently inhibited investment in this sector
- Industry has little economy of scale and high production costs relative to nearby countries
- High cost of imported eggs, fingerlings and feed pellets
- Still some negative perceptions on freshwater farm fish that is impacting on trout
- No targeted promotion of trout re imports or other domestic species by producers

Potentials

- Raise production levels, lower costs and promote the products
- More added value and processing to raise revenue and widen the market portfolio; smoked trout is widely accepted but rarely seen
- Catch limits in the wild fisheries auger well for attractive well-known farmed species
- New products and market diversification with trout reared in salt water cages or marine RAS systems

Risks

- Drought, low water flow and poor water quality as continuous threats
- Disease problems with imported fish and waste from fish cleaning operations by distributors – processors
- Potential problems with aggressive animal welfare activists taking a very narrow, negative, view of fish reared in raceways
- Cheap imports from neighboring and distant countries exerting price pressures
- Long term climate change warming a threat to these cold-water fish

Annex VII: Recirculating Aquaculture System (RAS) Farming Sub-Sector Analysis

Assets

- Climate change resilience due to complete environmental control
- Recirculating systems deliver a very concentrated waste stream, qualifying a wide variety of lower cost waste management techniques

Constraints

- High infrastructure, equipment and start-up costs
- Domestic technology, equipment manufacturer and knowledge very limited
- Increased operational cost

Potentials

- Most of EU countries consider RAS as a future of the industry
- Prospect for the intensive growth of high value warm water carnivorous species such as pike perch, wels and catfish
- Ability to shorten the breeding cycle of species like trout and carp by constantly maintaining optimal environment
- The closed system allows for the cultivation of desirable alien species, such as salmon, pangasius and tilapia, because it prevents fish from escaping into the environment

Risks

- Relatively high capital investment in technology not proven in Croatia can scare investors away
- Appropriately designed hardware has to be integrated with co-developed management techniques and both skills are rarely available in Croatia