





ACTION FOR CHANGE POSITION PAPER







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UAlg





Súdarás na Gaeltachta



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In 2018, a consortium of Development Agencies and Research Institutions across the Atlantic Area submitted a joint funding proposal to the INTERREG Atlantic Area funding programme. The trans-European partners were committed to developing new concepts, methodologies and sustainable work practices which would assist local communities in maximising the economic and social benefits of the maritime resource. The funding application was approved by the EU Commission in Spring 2019. The Access2Sea programme was implemented over 48 months with an overall investment valued at €1,867,105. This research and development programme has delivered tangible outputs in terms of new learnings and methodologies, the development and administration of pilot demonstration projects, the elaboration of new models for spatial planning and for business interventions which establish innovative routes to the sustainable development of the marine resource. The partners involved in the consortium believe that key elements of the project outcomes are transferable and scaleable in other EU

contexts and will represent an important resource in the development of this sector over the coming years. The report which follows sets out the key learnings and the project outcomes which have been delivered since the programmes's inception.

The consortium partners wish to thank and to recognise the key role of the EU Commission in agreeing to provide funding support for the programme's implementation. The partners are also indebted to the local communities including the participating organisations and their representatives on the Local Follow-on Committees, the social enterprises and the private companies whose experience and expertise formed the basis for the programme's successful implementation across the different territories.

Ár mbuíochas libh uilig; Nos remerciements leur sont dus; Nuestro agradecimiento se lo debemos a ellos; to them we owe our appreciation and thanks.

Introduction and Overview

This Action for Change Position Paper (Position Paper) is based on the results and conclusions of the Acccess2Sea Project. The Position Paper will be used as a tool in continuing to support the project territories with the changes required for a sustainable aquaculture sector. The Position Paper will look at lessons learned in the partner regions and can be used to help other Atlantic Area regions in developing sustainable aquaculture activities that are socially accepted and recognised as adding value to local development.

The paper will focus on the outputs and results of the Access2Sea partners and will provide an overview on the main themes of the project namely **spatial planning** for aquaculture, **social acceptance** of aquaculture and **business models** to improve the business environment, growth, and jobs creation potential of the aquaculture sector.

Spatial Planning – as a major food production subsector, aquaculture has become the focus of considerable attention giving its potential to support measures to address the growing seafood supply gap this should be supported where possible by a reference to the relevant data source. However, spatial planning for aquaculture can prove challenging and problematic. Throughout the EU, ongoing research highlights that identifying and securing suitable development sites for aquaculture development is increasingly becoming a significant structural problem for public agencies and private commercial undertakings alike who seek to develop and expand investment in the sector. Productive sector enterprises in different aquaculture activity (shellfish farming, seaweed cultivation, etc) require access to terrestrial production sites and in-shore and offshore sites which require immediate proximity to the sea. However, coastal and maritime regions and the activities they support are distributed across multiple users and uses and are typically subject to significant pressures, including urbanisation, artificialisation of soils, maritime and land pollution. Aquaculture production enterprises are necessarily bound to compete for space and suitable development sites with other marine and coastal activities. For example, the maintenance of shellfish farming and its development face strong competition from real estate pressure, yachting, tourism and other maritime activities.

As a development and planning instrument, marine spatial planning is used to provide clear information and data relating to the zoning of land to ensure the needs of existing or future companies are met. Effective spatial planning also makes it possible to establish an intervention strategy to prioritise the deployment of available resources from public and / or private operators active in these coastal and maritime regions. If the aquaculture sector is to grow and develop on a sustainable basis, it is necessary to plan effectively for the available and potential space which can support development and investment measures.

In recognising the significant policy and development challenges posed by marine spatial planning, Access2Sea has developed a methodology that will allow the identification of investment opportunities and space for the implementation of aquaculture farms in the European Atlantic Area.

The Access2Sea partners have undertaken this work by means of sharing their respective knowledge, methodologies, and experiences and through working on existing tools to develop new innovative ways to deal with spatial planning issues in aquaculture. This is documented in Section 2.

Social acceptance – one of the main obstacles to the development of aquaculture activities is low social acceptance at local, community and societal level. Access2Sea has assessed the current issues concerning social acceptance as it relates to aquaculture across the project territories. The project partners have identified practical and realisable methods to improve social acceptance among local stakeholders and which can be transferred to support future and existing aquaculture enterprises across the Atlantic Area. This is documented in Section 3.

Business Models – another area in which Access2Sea was involved was improving the business environment to allow growth in the aquaculture sector. The business model work package aimed to improve the business environment, growth, and jobs creation potential of the aquaculture sector. It did this by addressing key factors that impact on the trading performance and sustainability of companies operating in the sector. Partners have also worked on improving the aquaculture production processes and techniques (aimed at fostering its sustainability), supporting knowledge transfer concerning good practices and technical interventions by involving SMEs in the interregional learning processes enshrined within the project. This is documented in Section 4.

The above themes are further supported by innovative pilot projects carried out in the participating regions and these are documented in Section 5.

A summary of the main results and conclusions and the capitalisation of the project results is provided in Section 6 and Section 7, respectively.

1.1 The Interreg Atlantic Area Funding Programme

As part of the European Union's Cohesion Policy, the Interreg Atlantic Area programme supports transnational cooperation projects in 36 Atlantic regions distributed across 5 Member States: France, Ireland, Portugal, Spain and the United Kingdom. The programme will contribute to the achievement of economic, social and territorial cohesion in each region and Member State.

The overall objective of the Interreg Atlantic Area Programme is to implement solutions to answer to regional challenges in the fields of innovation, resource efficiency, environment, and cultural assets, supporting regional development and sustainable growth.

The Interreg Atlantic Area Programme has a total budget of EUR 185 million, which comprises a fund allocation of EUR 140 million from the European Regional Development Fund (ERDF).

1.2 The Atlantic Area Territory in its EU context



1.3 Access2Sea Project Context

The European Union (EU) aquaculture sector accounts for approximately 20% of fish and shellfish production in the EU and directly employs about 70,000 persons. Overall EU production has remained relatively stable since 2000, whereas global production has been growing between 5% and 7% per annum. This is the case even though only 10% of overall Atlantic seafood production is aquaculture-based and that current research has identified very significant growth opportunities in the sector.

The sustainable development of the aquaculture sector is one of the principal objectives of the Common Fisheries Policy (CFP) and is also recognised by the European Green Deal (Green Deal) as a source of "low carbon" protein for human food consumption and animal feed. Further information on the Green Deal can be found at: https://commission.europa. eu/strategy-and-policy/priorities-2019-2024/ european-green-deal_en

The EU considers aquaculture a growth sector which has the potential to create significant new employment, which can provide consumers with a high-quality, healthy food source based on sustainable production practices and contribute to the reliability and security of the future European food supply chain. Aquaculture does not fall under an exclusive EU competence. When an area is under exclusive EU competence it means that the EU alone can pass laws. The role of member countries is limited to applying the law, unless the EU authorises them to adopt certain laws themselves. In these areas, the EU has what the treaties call exclusive competences: customs union competition rules for the single market, monetary policy for the eurozone countries, trade and international agreements (under certain circumstances) and marine plants and animals regulated by the common fisheries policy.

In 2013 the EU Commission adopted non-binding strategic guidelines for the sustainable development of EU aquaculture. These guidelines served as the basis for the development of specific national strategic plans for aquaculture across different Member States. The EU Commission works with Member States through an "open method of coordination" in order to promote the exchange of good practices among EU countries, including through the organization of technical seminars. The European Maritime and Fisheries Fund (EMFF) has a budget to support fisheries (including data collection and control), aquaculture and processing, as well as to the sustainable development of fishery and aquaculture areas and the Integrated Maritime Policy.

1.4 Overview of the Access25ea Project

Project name: ACCESS2SEA

Project identification Code number: EAPA_1059/2018

Total budget: €1.867m

ERDF	€1,400,329.44
National Match Funding	€466,776.48
Eligible costs	€1,867,105.92
Total costs	€1,867,105.92

Partner Organisations:

- 1. CEEI Bahía de Cádiz, Spain (Lead)
- 2. WestBIC, Ireland
- 3. Údarás na Gaeltachta, Ireland
- Ctaqua, Aquaculture Technology Center, Cádiz, Spain
- 5. Investir En Finistere, France
- 6. University of Algarve, Portugal
- 7. Technopole Quimper-Cornouaille, France
- 8. Swansea University, Wales
- 9. CIIMAR, Portugal
- 10. Technopôle Brest-Iroise, France

1.5 Project Aims and Objectives

The main objective of Access2Sea is to improve the attractiveness of the aquaculture resource in the Atlantic Area for SMEs through creating and enabling new business opportunities for such SMEs and to drive more competitive and sustainable blue growth in the Atlantic Area.

Building on the project partners existing knowledge and experience, and through promoting the reuse and transfer of such knowledge among SMEs, development agents and policy makers, the programme will achieve the core objectives laid out by Access2Sea.

The implementation of the Access2Sea Work Packages has improved the attractiveness of the targeted coastal regions in terms of new and continued investment by aquaculture SMEs by enabling new sustainable, commercial enterprise opportunities and through improving greater access and to the resource base by:

- o unlocking existing regulatory, technological, acceptability and planning barriers to new and continued investment in the sector
- o disseminating existing and new technical, planning and development solutions to current challenges
- o providing support to the aquaculture SMEs with the aim of creating new and sustainable investment opportunities for them in the Atlantic Area
- o improving co-operation between stakeholders to improve collaborative relationships and to facilitate innovation and knowledge transfer in the aquaculture sector.

1.6 Atlantic Area Action Plan

The purpose of the Atlantic Action Plan is to unlock the potential of the blue economy in the Atlantic area while preserving marine ecosystems and contributing to climate change adaptation and mitigation. This research and planning project is fully aligned with public policy objectives, global commitments concerning sustainable development and is fully integrated within the framework of the European Commission's political priorities for the planning period for 2019 – 2024.

The Atlantic Action Plan aims to:

- o promote innovation by sharing knowledge between higher education organisations, companies and research centres
- o contribute to the protection and improvement of the Atlantic's marine and coastal environment
- o improve connectivity by promoting cooperation between ports
- o create synergies for a socially inclusive and sustainable model of regional development

Spatial Planning

2.1 Marine Spatial Planning in Atlantic Area Territory – A Comparative Assessment

The Atlantic coast is one of the largest seafronts in Europe. In a context of a globalized economy and increased competition between territories, the Atlantic Area must be able to capitalize and highlight its differentiating assets to develop. The sea, a natural resource that cannot be relocated, is a differentiating and considerable asset for the AA. Europe and its member countries consider the economic issues linked to "maritimity" as strategic and have made it their objective to decline and sustain national, regional and local blue growth.

Aquaculture is one of the sectors supported by these different policies. Aquaculture is a major food production subsector receiving considerable attention to fill the growing seafood supply gap. However, in the EU and around the globe, the availability of areas suitable for aquaculture is becoming a major problem for the development and expansion of the sector. A production activity needs a physical space to produce, this seems to be obvious but in the case of aquaculture, this space is necessary linked to the sea: aquacultures (shellfish farming, seaweed cultivation) occupy areas on land and at sea which require immediate proximity to the sea. However, the sea and the coast are the object of many uses and are subject to significant pressures: urbanization, artificialization of soils, maritime and land pollution. Aquacultures are found in competition over space with all coastal activities. The maintenance of shellfish farming and its development face strong

competition from real estate pressure, yachting, tourism, and other maritime activities. It is therefore essential to perpetuate existing activities and equip oneself with the means to welcome and promote new activities (aquaculture, algoculture, etc.).

Spatial planning is a means of having clear information on the land and real estate offer on land as well as on concessions and sea zoning, existing or potential, to be able to meet current and future expectations of companies. This also makes it possible to establish an intervention strategy to prioritize the resources of public and / or private operators in these areas. If we want to develop aquaculture, we must be able to plan the available and potential spaces.

Access2Sea engaged in a comparative analysis of spatial planning practices in each of the partner regions. This allowed the partnership to highlight and consolidate examples of best practice in aquaculture spatial planning that can be transferred to other areas across the Atlantic region.

Wales

The Welsh National Marine Plan ("the Plan") is the first Marine Plan for Welsh waters. The plan deals with different sectors including aggregates, aquaculture, defence, dredging and disposal, fisheries, renewable energy, oil and gas, ports and shipping, deep sea cabling, surface water and wastewater treatment, and disposal and tourism and recreation.

The objective regarding aquaculture is to facilitate the development of sustainable aquaculture in Welsh waters, including promoting associated supply chains resulting from other sector activities. The Plan supports sustainable development by guiding and supporting effective, proportionate, and consistent decision making in support of the sector. The Plan will apply to all decisions with the potential to affect the marine plan area. The Plan takes a 20-year view and the Welsh Government has been working with the UK Government, local councils and other public authorities to ensure a joined up approach.

Further information can be found at this link: https://gov.wales/sites/default/files/ publications/2019-11/welsh-national-marine-plan-document_0.pdf



Portugal ·

A more efficient and shorter licensing process was introduced in Portugal in 2017. This simplified a previously complex process which not only required two licenses but differentiated between aquaculture in inland waters and marine/brackish waters. With this Regulatory Decree it is possible, in theory, to authorize the installation of a new establishment within 90 days. However, prior licensing was always required, whether the establishment was on private land or in the public domain.

Further information can be found at this link: http://extwprlegs1.fao.org/docs/pdf/por205513.pdf

France

Law N°2019-469 protects the land of agricultural activities and marine culture which are subject to strong land pressures in the coastal areas (and especially the transformation of professional buildings into residential housing). The aim is to protect and keep the production areas necessary to maintain and develop marine cultures from strong pressures in coastal areas where professional buildings or production areas may be turned into residential housing.

Before this law, one could pre-empt an aquaculture farm for sale for residential purposes only if it had been used for cultivation in the last five years but the period has now been extended to twenty years in coastal areas for marine activities which require proximity to water.

Further information can be found at this link: https://www.legifrance.gouv.fr/download/file/ bZMxjhqY5xxDBg7_WMIPJJzKY6oT0Ac8uyatwTORrks=/JOE_TEXTE

Ireland

The National Marine Planning Framework was published in 2021 as part of Project Ireland 2040. This framework brings together all marine-based human activities for the first time, outlining the Irish government's vision, objectives and marine planning policies for each marine activity, including aquaculture. The Minister for Agriculture, Food and the Marine commissioned an Independent Review of Aquaculture Licensing in 2016 and the Report of the Group was submitted to the Minister in May 2017. The Review Group carried out a detailed examination of the existing aquaculture licensing process, undertook comprehensive stakeholder consultation and looked at comparative national and international consent systems to determine best practice for managing a complex licensing process in a transparent, environmentally appropriate and legally robust manner.

The Group's Report is published and available to view on the Department of Agriculture, Food and the Marine's website. A total of 30 separate recommendations are contained in the Report. As all industry stakeholders and the EU Commission have, for different reasons, identified the elimination of the licensing backlog as the overriding priority in the reform of the licensing system, the Department's response to date has focused on this issue while continuing to have regard to the other recommendations in the Report. Reflecting the key priority attached to the elimination of the licensing backlog by industry representatives, the Department immediately put in place a two-year programme to eliminate the backlog of shellfish licence applications. This two-year programme involved the achievement of 300 licence determinations in 2018 and again in 2019. A total of 305 and 324 licence determinations were achieved in 2018 and 2019 respectively. The Department has made over 1,200 licence determinations since 2012. The aquaculture licensing backlog in respect of shellfish aquaculture has now been eliminated as an issue affecting the industry. In the case of finfish, measures have already commenced to reduce this backlog and these measures intensified significantly in 2020. Reference to aquaculture production areas in Aquaculture Policy 2 are those indicated as Licensed Aquaculture Sites in the aquaculture-related map. Note that these sites will change over time.

Further information can be found at this link: marineplan.ie

Spain...

The Catalogue of the Location of Suitable Areas for the Development of Marine Aquaculture in Andalusia aims to identify optimal areas for aquaculture based on compatibility between activities in the same area and technical criteria such as depth and distance to the nearest port. This is a technical-administrative process by which, based on a sectoral and spatial analysis, those geographical areas are determined where, from an administrative point of view, future development of aquaculture activity can be planned.

Depending on each activity analysed with respect to aquaculture, different levels of potential are determined, which lead to different degrees of suitability:

Level of Potentiality: with regard to the development of aquaculture together with other activities in the same area, different levels of potentiality can occur:

- o **High potentiality**: the identified activity can be developed simultaneously with aquaculture, generating enabling or favourable conditions for the development of both.
- **Medium potential**: the development of the aquaculture activity in areas where other activities are identified can generate some conditioning factors without being unfavourable for the synergy between both activities, i.e. without producing negative effects.
- o **Potential for conflict**: when the development of an activity means limiting or disabling the development of aquaculture.

Degree of Suitability can be classified as follows:

- o **Suitable areas**: Wide areas in which marine aquaculture can be developed, according to general (administrative) and technical (depth and distance) parameters, differentiating between
- **§ Suitable areas**: those that have been defined based on parameters and criteria that do not limit the activity.
- § **Suitable areas with limitations**: those that may be limited by parameters, other uses or regulatory limitations.
- o **Suitable areas with limitations**: Those that may be limited by parameters, other uses or regulatory limitations.
- Aquaculture easement zones: More restricted areas where exhaustive studies will be carried out and which are considered suitable for the development of aquaculture activity. These are areas that do not contemplate parameters or criteria that could limit the activity and are the object of study for their declaration as Areas of Interest in the future. They also have a minimum surface area to house an economically and technically viable aquaculture project.

Further information can be found at this link: https://servicio.pesca.mapama.es/acuivisor/

The following tables summarise the comparative analysis of spatial planning practices in each of the partner regions.

	Andalusia (Spain)	Algarve-Porto (Portugal)	Finistere (France)	Wales(United Kingdom)	Ireland
Who carries the approach	Government of Andalusia	Portugese Government/ Ministry of Agriculture and Sea	Private approach let of IEF for land areas	Welsh Government	Department of Housing, Planning and Local Government
Other initiative	Interreg Project on a little zone on the border with Portugal	Strategic Plan for the Portugese Aquaculture	Government approach for on sea but not edited yet		Dept of Agriculture, Marine and Natural Resources
Date	2014 – 2018 In 2018 the POCTEP AQUA 7 AMBI Interreg was updated by AgAPA (Junta de Andalucia and CTAQUA)	2014 – 2018	2015	2020	2018 –2021
Duration of the work	In 2013, the first study on the location of suitable areas was published. Since then, work has been done on updates and development of the complementary studies in the Andalusian Mediterranean as a location for areas of interest. Likewise, the POCTEP AQUA & AMBI project has worked on an update of the information and a case study of the Bay of Cadiz	7 year plan	Updated each 2 years informative documents	20-year plan	20-year plan

	Andalusia (Spain)	Algarve-Porto (Portugal)	Finistere (France)	Wales(United Kingdom)	Ireland
Is there a diagnostic of the current situation?	Yes	Yes	Yes	Yes (Constrains and opportunities analysis	Yes
Main facts of the current existing situation (species)	Fish production is the most important activity in the Andalusian marine aquaculture, around 80%. In second place is the production of molluscs, approximately 20%, followed by crustaceans, with a percentage less than 5%. Algae count for a small percentage of less than 0.1%. The transformed marshes host a large number of aquaculture establishments, and in them the culture in ponds is developed under the tidal influence. These species have traditionally been produced through monocultures, polycultures, multitrophic	The cultivation of marine and brackish species in Portugal began in coastal waters, in estuaries and coastal lagoons, using extensive production regimes, reusing, in particular, the infrastructure of the salt industry. With regard to the evolution of the species, there are three different periods. Until the 70s, aquaculture production was dominated by mugilids, typically forage species and of low commercial value which represented about 80% of fish production. The 1980s werer characterized by the large increase in fish farms in inland waters (particularly rainbow trout), accompanied by bivalves (especially clams) in brackish waters. The 90s are characterized by the strong growth and modernisation of marine species aquaculture, initially centred on sea bass and sea bream and more recently on turbot and sole	On-shore: shell fish buildings or facilities without or with seawater intakes, anonymous data (no names of owners). On sea, areas without indications about species	The production of farmed finfish in Wales is currently limited and is confined to on- shore facilities. Most production in Wales focuses on shellfish (blue mussels), some intention to expand to the native oyster and scallops. Seaweeds generate a lot of interest. Microalgae had a big push in the last 5 years. (Page 80, Welsh National Plan)	Legacy of species- specific licensing. Lag in planning decisions.

	Andalusia (Spain)	Algarve-Porto (Portugal)	Finistere (France)	Wales(United Kingdom)	Ireland
Potential areas Yes or no	Yes		Yes	Yes	Yes
Key methods of methodology	4 phases: 1 / Delimitation of the study perimeter 2 / Technical parameters 3 / Administrative parameters 4 / Analyse compatibility	Main axes of strategic intervention: the interventions necessary to achieve the strategic objective for the aquaculture sector in Portugal are grouped into three axes. One of those axes is related to spatial planning	The approach allowed to define the parameters - List the constraints - To compare data with GIS with technical interviews - To list the existing areas/to define on-shore potential ones/to define large areas on sea.	The methodology included a detailed work plan: Data collection and processing • Constraints and opportunities analysis • Production of evidence packages (page 6; SMMNR report)	The methodology included the development of a roadmap and baseline report, a draft National Marine Planning Framework and associated environmental reports as well as data collection on a new Marine Atlas, finalisation phase of NMPF and implementation, monitoring, enforcement and review of the plan
Results – potential Please specify for onshore and offshore.	Cádiz: 3 areas (Bahía de Cádiz, Marismas del Barbate, DoÑana). Total: 10 sectors studied Huelva: 3 areas (Marismas del Odiel, Marismas del Río Piedras and Flecha del Rompido, Marismas de Isla Cristina). Total: 9 sectors studied in the south Atlantic region of Andalusia	Facilitate access to space and water that aims to identify spaces with water resources with greater potential for aquaculture and which have lesser environmental impacts, ensuring their compatibility with other users of those resources	57 areas onshore/ on sea, couldn't obtain areas only large zones	Offshore: seaweeds, and sea cages with shellfish. Onshore: sea-cage installations for seaweeds (page 80, Welsh National Marine Plan)	Zero offshore at present, 111 licensed businesses and 19 of those current clients of Údarás

	Andalusia (Spain)	Algarve-Porto (Portugal)	Finistere (France)	Wales(United Kingdom)	Ireland
Public or private information	Public	Public for existing sites Private for potential sites	Public for existing sites Private for potential sites		Licenses are in public domain, application in process are strictly confidential
Key success	Representation of administrative information that affects the space provided by all public bodies with powers on the ground (DPMT) Active participation of stakeholders	Potential to increase production of high quality and highly valued species; possibility of installing new sites in the open sea and even, in association with other activities	A federated approach with all the stakeholders		Very high level of stakeholder engagement and support
Lack	Representation of the most appropriate type of crop according to environmental characteristics (it has only been worked from an administrative point of view) Loading capacity	Incipient planning with consequent difficulty in identifying areas for aquaculture activity	No nominative data, potential areas not detailed by species or type of project		Planning which was refused upon initial application; reapplication is in process
Next steps/ comments	Development of studies that allow the integration of production models according to administrative, environmental and location characteristics	The existence of a significant potential for increasing aquaculture production can be an attractive factor for larger and more competitive com- panies that can induce greater entrepreneurship, the dynamization of the research and the development of new technologies	Onshore: define suitable areas by type of project// On sea: we wait for the govermental approach		Current objective is to map our data to the GIS Marine Atlas

Further Information: https://access2sea.eu/wp-content/uploads/2023/01/A2S-WP4-Final-Report-Action-2_DEF-LP_V2-update-june-22.pdf

COMPARISON SPATIAL PLANNING SITUATION in the regions involved Finistère (France), Galway (Ireland), Andalusia (Spain), Algarve & Porto (Portugal), Wales (United Kingdom)

Transfer methodologies and best practices in Marine Spatial Planning – a summative evaluation

The Access2Sea partnership agreed that there are difficulties in transferring best practice in spatial planning as it is a highly localised issue. Regulations differ from country to country, region to region and between different aquaculture activities. The partners did agree on the following key points, however, namely, that in all countries:

- Spatial planning is an intensive, complex and timeconsuming process
- Spatial planning requires the management of significant volumes of complex data sets
- Spatial Planning requires the involvement of all relevant stakeholders throughout the process.

The Access2Sea map of opportunities aims at providing information to onshore and offshore actual and potential aquaculture producers about the best sites and investment opportunities for installing aquaculture activities in the regions involved: Northwest Region (Ireland), Wales (UK), Brittany (France), Andalucía (Spain) and Portugal.

By clicking on the specific locations, you can find different space planning tools which have been improved or identified in the framework of the Access2sea project, which can help you assess the territorial opportunities available for installing your aquaculture business.

The map of opportunities can be found on the Access2Sea website: https://access2sea.eu/a2sopportunities-map/ and will be kept up to date after the project comes to an end.



Further information can be found by scanning the QR code with your mobile phone.





The Challenge of Marine and Coastal Development and Social Acceptability

3.1

Evaluation of the social acceptance of aquaculture development in the Atlantic Area

Social Acceptance and Consumer Information

Seafood is a healthy source of animal protein, providing calcium and minerals, omega-3 and other beneficial fatty acids, and vitamins B12 and D¹. Seafood also has an environmental advantage in terms of resource use in relation to other animal protein production systems. With an efficient feed conversion rate (FCR), estimated as the proportion of feed intake by the weight gained by the animal, fish production has a lower environmental impact as less feed is required to produce a ton of fish², between 1.0 and 2.4, compared to 6.0–10.0 in beef, 2.7–5.0 in pigs and 1.7–2.0 in chicken³.

This efficient FCR, along with high fertility rates, also contributes to a significantly lower greenhouse gas (GHG) emission intensity than ruminants, another important contribution of seafood aquaculture to environmental sustainability.⁴

Despite the understanding of its ability to address the challenges of global nutrition and technological advances that have allowed better monitoring of environmental impacts, as well as optimizing the management of productive activity, the aquaculture industry still faces strong animosity from the local communities regarding new projects for fear of the environmental harm the farms may cause.⁵⁶

In fact, the concerns regarding the environmental impacts of aquaculture and agriculture are leading

the agenda of scepticism or social rejection about agromania production activities.

In this section, we will try to understand the social perception about aquaculture, the importance of the media in the construction of public opinion, among other areas that refer to the importance of providing clear, transparent, and scientifically verified information to society.

Aquaculture in the Media

Aquaculture is one of the most demonized productive activities by conspiracy theories and media sensationalism. News headlines from developed nations have been shown to be overall more negative than those of developing countries.⁷

An analysis of German media showed positive coverage of aquaculture was the most prevalent tone, and when negative tones were used, they were often counteracted with ways in which such an issue could be dealt with, leaving the readers with an overall positive to neutral impression of the industry.⁸

There is a huge inequality between the media space that the actions of protest aquaculture and the voice of the sector to enlighten the consumer. How the public perceives the industry influences the acceptance and implementation of new aquaculture operations.^{9 10}

Outside the domains of the media, but with enormous weight as an opinion-makers, film documentaries have played a decisive role in building or destroying the image of various economic activities. Recently, fisheries and aquaculture were under attack in "Seaspiracy" documentary available in the popular media streaming platform (Netflix). 'Seaspiracy' dehumanises aquaculture sector on its sensationalist and subjective approach to the health of the oceans. The existence of these media productions is not counterbalanced with other contents that allow elucidation of the activity rather than casting suspicions and therefore they contribute to feed the need to justify theories that seek to destroy the credibility of productive activities.

Considering all global trends, aquaculture will continue to be a booming productive sector, therefore tensions between industry and communities are expected to be intensified in the short term. Therefore, media training of the main aquaculture's stakeholders (ie: producers) and an investment on media literacy about aquaculture could provide short-time results, at least, in order to reduce fake news and conspiracy theories amplified by the spread of the media.

Understanding Factors Influencing Social Acceptability

Community and consumer's perceptions of aquaculture and, consequently social acceptance, are quite variable and are likely influenced by a combination of factors. Several studies have identified factors that may lead to any potential opposition of the industry, but perhaps the most notable are perceived environmental risks and credibility of information sources.^{11 12 13}

Additionally, previous studies have found that the public is most often concerned with any potential risks for human health if farmed products are consumed,



SeafoodSource

ENVIRONMENTAL ASSOCIATIONS UNITE WITH HEARTBURN TO DEMONSTRATE AGAINST AQUACULTURE CAGES

Figure 1: Social conflicts on media

- ¹ U.S. Department of Agriculture and U.S. Department of Health and Human Services (2020), "Dietary Guidelines for Americans, 2020-2025"
- ² d'Orbcastel, E.R., J-P. Blancheton, and J. Aubin (2009), "Toward Environmentally Sustainable Aquaculture: Comparison between Two Trout Farming Systems Using Life Cycle Assessment."
- ³ Fry, J.P., N.A. Mailloux, D.C. Love, M.C. Milli, and L. Cao (2018), "Feed Conversion Efficiency in Aquaculture: Do We Measure It Correctly?"
- ⁴ MacLeod, M.J., M.R. Hasan, D.H.F. Robb, and M. Mamun-Ur-Rashid (2020), "Quantifying Greenhouse Gas Emissions from Global Aquaculture."
- ⁵ Bacher (2015), "Perceptions and Misconceptions of Aquaculture"
- ⁶ Bacher et al. (2014), "Stakeholders' perceptions of marine fish farming in Catalonia (Spain): a Q-methodology approach"
- ⁷ Froehlich et al. (2017), "Public perceptions of aquaculture: evaluating spatiotemporal patterns of sentiment around the world"
- ⁸ Feucht and Zander (2014), "What do German Consumers Expect from Sustainable Aquaculture?"
- ⁹ Knapp and Rubino (2016), "The political economics of marine aquaculture in the United States"
- ¹⁰ Verbeke et al. (2007), "Consumer perception versus scientific evidence of farmed and wild fish: exploratory insights from Belgium"
- ¹¹ Bacher et al. (2014), "Stakeholders' perceptions of marine fish farming in Catalonia (Spain): a Q-methodology approach"
- ¹² Freeman et al. (2012), "Public attitudes towards marine aquaculture: a comparative analysis of Germany and Israel"
- ¹³ Mazur and Curtis (2008), "Understanding community perceptions of aquaculture: lessons from Australia"



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Protestors urge farmed salmon boycott outside Good Food Ireland awards

Environmental groups protested outside the Good Food Ireland awards and called on the food and tourism sector to boycott farmed salmon this Christmas.



Figure 2: Media conflict in Ireland

with little focus on benefits such as what the industry means for local economies.^{14 15}

Aquaculture's public opinion is interlinked with the understanding of its environmental interactions¹⁶ and impacts and this understanding is often informed by the media.¹⁷

While media effects theory is complex, and an evergrowing field of study, research has shown that mass media can heavily impact public awareness of certain topics and issues, their perceptions towards the issue, and in some cases, can even influence individual behaviours.¹⁸

In the case of aquaculture, the media may not have the ability to tell people what to think, but rather may be quite successful in telling people what to think about.¹⁹ It is also possible that media coverage follows public opinion to confirm what they believe, as a way to expand and maintain their audience. ^{20 21}

The battle of the audience is, in fact, the great ambition of media's actions. They could still vary in the tone used to cover certain topics and issues, but public opinion would be the main driver of media coverage, rather than the reverse. As such, given that media can influence public perceptions or reflect

public opinion, understanding how media portrays aquaculture can provide valuable information regarding factors of social acceptability and consequently inform decision-making.

In aquaculture, the emergence of widely held but false beliefs or ideas has been described concerning various topics such as feed^{22 23,} genetic manipulation, or the use of therapeutic products.²⁴ Some of these myths condition consumer's perception of aquaculture and its products. The negative perceptions included the lack of sufficient information about aquaculture and quality.

A negative perception by local stakeholders of aquaculture activities, notably their impact on the environment and other economic activities, is often an obstacle to the establishment of new aquaculture facilities. Therefore, it is critically important to ensure more accurate information and transparency about how aquaculture activities are carried out.

Increase Transparency and Consumers' Information

Information is essential to meet the increasing consumer demand for sustainable products.²⁵

Making consumers more aware of the efforts made by EU producers is important to allow EU production to reap the benefits of high sustainability and quality standards. This will help to make EU aquaculture products more competitive and also ensure a level playing field with other aquaculture products that may not offer equivalent sustainability and quality.

Improving the information available to consumers and the public on EU aquaculture production

In 2021, the communication from the European Commission to the European Parliament, the European Council, the European Economic and Social Committee and the Committee of the Regions Empty, "Strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021 to 2030", identified a mix of different tools to improve the information available to consumers and the public on EU aquaculture production, including the following efforts: Communication will be necessary to realise the potential of a more diversified aquaculture to meet the challenges identified in the European Green Deal. These challenges include increasing the knowledge and consumption of aquaculture products with a lower environmental footprint, under-exploited lowtrophic species such as algae, shellfish and other invertebrates, and herbivorous fish.

- (1) Labelling and marketing standards;
- (2) Information campaigns about the EU aquaculture sector and production that involve retailers;
- (3) Clarifying the scientific basis of the debate on the impacts of aquaculture activities in the EU;
- (4) Further opening the sector to the public;
- (5) Ensuring close and early engagement of authorities and industry with stakeholders' groups, including NGOs;
- (6) Promoting the use of branding and quality labels;
- (7) Promoting the value of EU aquaculture as 'local and fresh' with short food circuits.

- ¹⁸ Macnamara (2005), "Media content analysis: its uses; benefits and best practice methodology Asia Pacific Public Relations"
- ¹⁹ Olsen and Osmundsen (2017), "Media framing of aquaculture"
- ²⁰ Gentzkow and Shapiro (2010), "What drives media slant? Evidence from US daily newspapers"
- ²¹ George and Waldfogel (2006), "The New York Times and the market for local newspapers"
- ²² Ayvaz (2017), "Consumer preference for seafood: the myths and realities, in: fifth international conference sustainable postharvest and food technologies"
- ²³ Hardy (2005), "Fish meal myths concerning omnivorous farmed fish"
- ²⁴ Bergh (2007), "The dual myths of the healthy wild fish and the unhealthy farmed fish"

¹⁴ Amberg and Hall (2008), "Communicating risks and benefits of aquaculture: a content analysis of US newsprint representations of farmed salmon"

¹⁵ Schlag, 2011, "Aquaculture in Europe: media representations as a proxy for public opinion"

¹⁶ Feucht and Zander (2014), "What do German Consumers Expect from Sustainable Aquaculture?"

¹⁷ Osmundsen and Olsen (2017), "The imperishable controversy over aquaculture" ⁸ Macnamara (2005), "Media content analysis: its uses; benefits and best practice methodology Asia Pacific Public Relations"

²⁵ European Commission (2021), "Strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021 to 2030"

Initiatives

Just like any other activity, the expansion of aquaculture also requires social acceptance (so called "social license to operate"). As mentioned above, the perception of aquaculture activities remains negative among certain stakeholders. This is mainly due to concerns about aquaculture's impact on the environment or about how it conflicts with other economic activities such as fisheries or tourism.

It is important to address these concerns by:

- (1) ensuring transparency and the early involvement of local stakeholders in the planning of an aquaculture activity; and
- (2) seeking synergies with existing activities (e.g., fisheries, tourism, the processing industry) and protected areas. In addition, there is great potential in creating local value chains and short supply circuits, which should contribute to environmentally, economically, and socially sustainable food production.

The experiences gathered from the work of fisheries local-action groups (FLAGs), as well as projects funded under the EMFF in some Member States, show some good practices in this area.



EIT Food – Sustainable Aquaculture https://www.eitfood.eu/

The European Institute of Innovation & Technology (EIT) is the world's largest and most dynamic food innovation community. The work in collaboration with all the stakeholder of food value chain, aiming to build an innovative and resilient food system that in turn creates a healthier society and planet.

EIT FOOD developed the Sustainable Aquaculture programme aiming to transform the sector by reducing its carbon footprint, transitioning to circular economy, and ensuring food security and safety. In all the initiatives developed by the EIT, training courses and competitions to stimulate sustainable innovation in the aquaculture. Recently, EIT has selected SMEs and start-ups with solutions in an advanced stage of development from 15 European countries, including devices that obtain drinking water from the air or IoT sensors to improve the efficiency of irrigation, to participate in the EIT Community Water Scarcity initiative.

Water scarcity is one of the major current and future problems in Southern Europe, which affects the entire value chain of the agri-food industry and for which it is necessary to find urgent solutions. The objective is to facilitate the transition to a watersaving economy and to contribute, in the long term, to reduce water consumption, waste and pollution in Europe. 40 start-ups and SMEs from 15 different countries have been selected, some of them directly related to aquaculture or water quality management challenges in aquaculture production.



Irish Ocean Literacy Network (IOLN) https://irishoceanliteracy.ie/

Based on the international Ocean Literacy concept, IOLN goals include creating a membership of Ocean Literacy Champions on the island of Ireland, who collaborate, share and co-ordinate marine outreach and Ocean Literacy projects, while providing a platform for engagement between stakeholders.

Following the path of literacy and education, within the various activities developed by the network, include projects that allow young communities to be sensitized to the importance of aquaculture in society.



Primary Science and Maths Programme (DPSM) www.primaryscience.ie

DPSM is part of Science Foundation Ireland's Education and Public Engagement Programme, which aims to increase interest in science, technology, engineering, and mathematics (STEM) among students, teachers, and members of the public. DPSM originated in 2003 with the goal of introducing primary school students to science in a practical, hands-on, enjoyable, and interactive way. Since 2010 the programme has been run in conjunction with the European Space Education Resource Office (ESERO) Ireland which uses space to inspire and engage young people in science and technology in the world around them.



Seascapes Project https://emff.marine.ie/

Seascapes, described in its own words as '... very much concentrating on the Seascape Character Areas at the regional scale and an online survey is available also, focusing on the draft names, boundaries, and key characteristics'.

It is a cultural characterization of the Irish coast that could be likened to a geological survey; the corollary is characteristically mapping the coastline human activity and interaction. This project is being sponsored by the Marine Institute.



BIM: EMS for Aquaculture https://bim.ie/aquaculture/

Helps farmers and producers implement an Environment Management System (EMS) on fish and shellfish farm, based on agreed targets to improve your farm's environmental performance, including:

- (1) waste management;
- (2) nature conservation;
- (3) visual impact;
- (4) even the use of public piers.



Catchments.ie https://www.catchments.ie

Catchments describes inshore and inland water quality for a spectrum of users, from bathing quality to fishing A, B, C quality. This is a water quality management GIS tool and as such is not an initiative to improve social acceptability per se. In that it includes all usages—from bathing quality and aquaculture on the same platform, it provides a context for visibility of marine farming adjacent to and co-existing with marine tourism.

SEMRU Leisure Activities Survey

SEMRU Socio-Economic Marine Research Institute: Marine socio-economic research unit based in the National University of Ireland, NUI Galway -Interdisciplinary, focus on marine socioeconomics and coastal development.

SEMRU launches a new report valuing domestic coastal and marine tourism and leisure activities in the Republic of Ireland: A survey of domestic coastal and marine tourism an leisure activities in Ireland. http://whitakerinstitute.ie/project/usageof-irish-seas-and-coastal-ecosystems-for-tourismdevelopment-uisce-tourism/

Initiatives in the UK to promote seafood

Seafood is not very popular in the UK, consumption is low (19.73 kg/ capita) in comparison with other European countries (average of Access2Sea countries is 35 kg/capita²⁶).

According to the U.K. government's Department for Environment, Food, and Rural Affairs (Defra), the average person in Wales eats 145.9 grams of seafood per week (7.6 kg/capita/year), which is lower than the U.K. average of 152.8 grams per person per week. Fish is served at UK schools only once a week, often as an option and it is the only kind of seafood offered. In general, cost and lack of knowledge on how to cook it seem to be the main obstacles to increase seafood consumption in the UK.

Most UK initiatives and campaigns about fish and aquaculture focus on raising consumers awareness of the health benefits to eat more fish and shellfish. Sea fish, a Non-Departmental Public Body (NDPB) set up to support the £10 billion UK seafood industry, supports some of these initiatives, which include Fish is the Dish (with recipes), Eat 2 fish a week (which labels packs with more than 50% of fish product) or the Seafood 2040 Strategic Framework. However, critical to increase UK seafood consumption is to sustainably increase domestic seafood production.

Several NGO campaigns focus on bringing awareness to fish as sensitive and intelligent animals (e.g. Re-think Fish).

Environmentalists and welfare advocates support the consumption of species lower on the food chain that do not eat other fish and recommend a decrease in seafood consumption overall (e.g. CIWF). With an aging population a greater portion of UK consumers are older than 50; their food habits and buying options reflect their preferences: health, taste and convenience (Seafish, 2018).

Sustainability labels currently do not play a major role in food consumers' choices²⁸. Increasing sustainable production needs, the collaboration of all the stakeholders involved in producing sustainable fish feeds, addressing biosecurity and emerging diseases and dealing with public perception and miscommunication.

Wales fish farm focuses on lumpfish (a non-chemical alternative to fight parasites in salmon farming) but several NGOs have raised concerns about lumpfish welfare. Welfare standards are lacking, and the industry has highlighted the need to implement welfare standards specific to lumpfish.

CSAR has been engaging with salmon and lumpfish farmers on how to develop welfare tools and for this, CSAR organised the first UK-based symposium on Welfare in Aquaculture – Welfare Indicators for Novel Species, which included a lumpfish welfare workshop. This event attracted 78 participants from a range of stakeholders including representatives of 26 companies, 6 Higher Education Institutions and 7 international speakers.

A white paper to be published soon will highlight the need to develop welfare standards and ways to implement it. A set of tools including an app and online training has been developed by CSAR as part of the Access2Sea project.

Although some welfare indicators exist for lumpfish not all can easily be used by fish farmers, and it is only recently that a rapid lumpfish operational welfare score index (LOWSI) was developed and validated by our group for use under farm conditions26. What we propose is to bring to the market the operational welfare score index for lumpfish based on the assessment of fin and skin damage, eye condition, and suction cup deformities, as these traits are the most informative, and can be easily scored visually without any specialised equipment. Given that loss of weight is one of the major welfare challenges for lumpfish, we will also develop the Lumpfish Weight Watcher, an online calculator to estimate the body mass index (BMI) of lumpfish to allow farmers to detect underweight fish and take remedial action.

CSAR delivered a questionnaire targeting 16 to 18 years old students from local Welsh colleges on the 16th of March 2020, during the Marine Energy

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at well					
at well	+	Recipes and tips	+	Digestive health	+

breastfeeding, and children and babies.



Event, Bridge Innovation Centre, Pembrokshire, Wales. Dr Sara Barrento delivered 4 workshops attended by 69 students aimed to disseminate the Access2Sea project. It was also the ideal platform to deliver the aquaculture awareness questionnaire. Most students knew what aquaculture is when given a MCQ (Annex 1). But they are divided when it comes to aquaculture environmental impacts – it can be positive (52% agree), but it can also be negative (58% agree).

Most students agree on two things: (1) Aquaculture can be good to the local economy; (2) It can have negative impacts on fish welfare. But a large part of the general public is relatively uninformed: European consumers do not seem to differentiate between farmed and wild products when purchasing seafood and aquaculture issues are not at the top of the minds of many consumers. Opinion and sentiments towards aquaculture depend on many factors including objective knowledge, but also preconceived ideas and beliefs.

The importance given to these different factors varies depending on a person's background, interest, level of knowledge and understanding.

²⁶ OWID (2017)

 $^{^{\}rm 27}$ 5 March 2020, NHS website

²⁸ Bacher (2015), "Perceptions and misconceptions of aquaculture: a global overview"

Media acts as an intermediary for scientific information reaching the public, particularly in the food sector. Most consumers receive information about the food industry through popular press and television. A study on sentiments and opinions of the public around aquaculture revealed that newspaper `aquaculture' headlines have increased and are overall more positive than negative, especially in Wales³⁰. But sentiment was negative for headlines with "salmon" included in the title. Sentiment also varies on distinct forms of aquaculture: while there is an expanding positive trend of general `aquaculture' coverage, the opposite is true for `marine' and `offshore' aquaculture which appeared more negative.



Figure 4. Diagram of factors affecting public perceptions of aquaculture²⁹

²⁹ Adapted form Bacher (2015)

³⁰ Froehlich, H. E., Gentry, R. R., Rust, M. B., Grimm, D., and Halpern, B. S. (2017), "Public perceptions of aquaculture: evaluating spatiotemporal patterns of sentiment around the world"

Fish Farming can have negative impacts to fish welfare



Figure 5: Concerns about fish welfare

Consumers are starting to realize how their food is produced; they are becoming more sensitive to the welfare of animals and the wellbeing of workers (M&S). As a result, farming companies are challenged by advocate groups, retailers seeking to supply consumers wishes at the cheapest price and highest quality, and the odd consumer or "YouTube trolls".

Governments, on the other hand, are challenged by the farming companies who seek support (e.g. agile licensing process; more relaxed food regulations) and consumers/voters who want healthy, sustainable and affordable food.

Most of the initiatives taking place in the UK have two general aims: to increase consumers awareness about seafood, or to gain consumers trust about a specific brand (e.g. aquaculture farm company or retailers). These initiatives usually happen at two different levels:

Company Marketing Strategies

- Salmon farms seek certification and labelling of products (e.g. Global Aquaculture Alliance, ASC).
- Aquaculture farms and retailers launch marketing campaigns focusing on health benefits, sustainably sourced products and how to cook and easy recipes.
- Aquaculture farms participate in events and awards.

Products

- Seafood companies focus on convenient and healthy products
- Development of apps (recipes, sustainable guides to fish buying, find a sustainable restaurant

Government

- Facilitating the promotion of seafood consumption through marketing and branding campaigns (e.g., Fish the Dish campaign run by SEAFISH, table 1)
- Funding projects to create a national brand (e.g. Welsh seafood brand)

It is important to highlight that the public uses a wide range of information sources about aquaculture, with different degrees of credibility. The results of several studies indicated that information transmitted through personal contact, such as friends and family, the fishmonger, retail sellers or visiting an aquaculture farm, were considered important and trusted, while the most common information sources - internet, television, radio, advertising and written media - are considered less-trusted sources.



Fig 1. Newspaper 'aquaculture' media sentiment. Sentiment over time based on the frequency of newspaper headlines with negative (*red*), positive (*blue*), and neutral (*gray*) titles for (A) developed (n = 1, 165) and (B) developing (n = 430) nations. Also depicted are the (C) proportional contributions of sentiment headlines relative to each developed and developing country, with the number of headlines from each country shown in parentheses. Only countries with more than 4 headlines are shown; 44 countries that contributed only 4.5% of the total headlines are not depicted, but can be found in the <u>S1 Table</u>. Headlines were compiled using the LexisNexis[®] platform.

doi:10.1371/journal.pone.0169281.g001



Figure 6: Aquaculture media sentiments

The definitive guide to sustainable seafood from the Marine Conservation Society. This App tells you which fish are good to eat, along with some suggested recipes for cooking them, and which to avoid based on whether they come from well-managed, sustainable stocks or farms. The guide includes almost every fish you could hope to find in UK shops, restaurants and markets, allowing you to make the best seafood choices.



Seafood Recipes Fitness Circle Food & Drink **** 436 * PEGI 3 Contains Ads - Offers in-app purchases Add to Wishlist Install



Seafood Recipes app will introduce you to a curated collection of dishes from all around the world. Seafood is considered as food by humans and is mainly contains fish, shellfish, shrimp, etc. Seafood is consumed all over the world. Iceland, Japan, and Portugal are the greatest consumers of seafood per capita in the world. Shellfish are particularly rich in zinc, which is essential for healthy skin and muscles as well as fertility.

Buying Seafood Online

Get UK seafood delivered direct to your door. From traditional fishmongers and specialist online seafood retailers who deliver UKwide to quayside fishermen and merchants.

We are working with seafood businesses across the UK to bring you direct access to some of the best fish and shellfish from around our shores.

Check out our handy map below and happy cooking.

JUSEAFORD YOURSELFD





3.2

Inventory of the methodologies and initiatives to improve social acceptance of the aquaculture sector

Promotion of aquaculture in Madeira Island (Portugal)

Sea bream is the most produced species in aquaculture in Madeira. It is a great source of omega 3 polyunsaturated fatty acids, like other species fished in the region. These fatty acids are essential for the development of the central nervous system and associated with the prevention of cardiovascular diseases. The high quality and freshness of Madeira' sea bream is recognized by the market, so it is distinguished by the highest price.

The Autonomous Region of Madeira, despite the small land territory, has great potential for the development of this activity in its component of floating fish cultures in the open sea, confirmed by a pilot project in the Bay of Abra and later made a reality by private enterprises. The discussions around the topic should be serious, constructive, with data and concepts from safe and credible sources, to consolidate the growth of this activity in a sustainable way, from an economic, social and environmental point of view. It is a booming sector. By 2020, Madeira wants to reach 5,000 tonnes of aquaculture production, at a time when aquaculture already earns five million euros for Madeira. Pointed as a sustainable alternative to fish imports, this activity is also seen as a way to reduce pressure on wild fish populations, but not everything is a benefit.

Madeira has two competitive advantages compared to other regions: the water temperature and the existence of research, under the responsibility of the Calheta Mariculture Center. The opportunities offered by the regional sea do not go unnoticed in the eyes of investors and aquaculture has proved to be a promising activity, hitherto well accepted by residents but the recent controversy in Ponta de Sol casts doubts about the impact of this activity and has generated some challenge and even demonstrations against the installation of sea cages.

About 500 people participated in a demonstration against the approved aquaculture project for the seafront in the municipality of Ponta do Sol, west of Madeira, alerting toln fact, the concerns regarding the environmental impacts of aquaculture and agriculture are the environmental impact and



Figure 7: Public petition against aquaculture

questioning the added value in the local economy, which is based on tourism. The President of the Pontassolense Autarchy counted on the support of hundreds of popular people who have promoted some protest actions and that have also stimulated a group entitled 'Vigília do nosso mar' on social networks. At stake is the visual impact of the cages on the landscape of the municipality that can be disadvantageous for tourist recipes.

In October 2020, the Minister of the Sea, Ricardo Serrão Santos was in Madeira for two events related to the sea, the MARE @ Porto Santo 2020 expedition and the public presentation of the National Strategy for the Sea 2021-2030.

The document refers to the "maturity" of aquaculture in Madeira, to the knowledge and experiences generated over the 20 years of regional production - the Region was a pioneer in the country – and as "a line of action to continue, valuing and capitalizing on knowledge acquired and promoting drag effects to other sectors, such as tourism and other offshore activities. During the presentation of the National Strategy for the Sea 2030, the Minister repeatedly underlined the importance of responsible and sustainable development of aquaculture for the blue growth of the country and Madeira, pointing to Madeira as "an example".

Marismar, a regional marine aquaculture production company, and Bluegrowth, a technological innovation consultant for sea affairs, organized a gastronomic event where they gathered several public figures in Funchal, in an event where the aquaculture sea bream from Madeira's coast was the main star of six dishes designed by three experienced chefs. The event was set to promote the consumption of aquaculture sea bream and to increase the social acceptability of aquaculture in general.

Public figures such as Rui Unas were present, participating in a set of initiatives to encourage the development of gastronomic and aquaculture tourism, having been participating in several related initiatives. This initiative was a joint organization of Marismar and Bluegrowth. Since last year, these two partner companies have been cooperating in the development of new projects and campaigns aimed at stimulating the sustainable development of the aquaculture and fisheries value chain.

Figure 8: Minister of the Sea, Ricardo Serrão, visiting fish farm production



Figure 9: Engagement of Chefs in aquaculture's promotion



Figure 10: Engagement of Public Figures with gastronomic value of aquaculture



Figure 11: Engagement of Public Figures diving in a cage

Salmon aquaculture industry in Chile

In Chile, aquaculture is almost synonymouswith salmon farming. Salmonid production represents 94% of exports from the aquaculture sector, concentrated in three species: Atlantic salmon (67.1%), Pacific or coho salmon (15.6%) and rainbow trout (9.2%). During the last decade, the production of other species has also emerged in an important way, such as algae and molluscs.

The Chilean mussel or mussel has an important participation in terms of production (27.8%), but very low in terms of exported value (4.1%). Unlike the latter, salmon production is almost exclusively export-oriented. The extensive coastline of Chile and the abundance of fjords with adequate temperatures and hydrographic conditions in the southern part of the country represent important natural comparative advantages for salmon farming in Chile.³¹ But the industry was not born from the free action of the market, but was the result of the significant and successful effort of development and transfer of knowledge and technological capabilities carried out by the State, in conjunction with various semipublic institutions and public-private alliances, and continuous international cooperation since the 1970s and, in particular, the 1980s. These initiatives allowed the subsequent entry of private actors of national and foreign origin, who, taking advantage of the accumulated stock of knowledge and contributing new technologies, gave a strong stimulus to the growth of the sector.

The emergence and the development of the Chilean salmon industry demonstrate the important role of technology transfer in industrial development. Technology transfer has enabled Chile to build a globally competitive and innovative salmon industry over the last two decades. The industry has become one of Chile's main export sectors and a significant contributor to regional development. Today, Chile is the second largest salmon producer in the world and develops technology for the production of other fish species.

The development of the industry was a painstaking process and success was not assured. Chile undertook several trials, including attempts to stock rivers and lakes, spanning several decades in order to master fish-farming technologies. It solicited technical support from several international institutions with experience in fish breeding and farming and used its national institutions to acquire, assimilate, develop and diffuse fish farming technologies. Some of the early firms were created by public institutions and researchers that had accumulated some basic operational knowledge and skills in fish farming.

The close cooperation between government agencies and the salmon producers played a vital role in the growth of the industry, especially in the development of licensing regulations, sanitary standards and supporting research and development activities (R&D). Similarly, R&D institutions have worked closely with the national fishing agency, the National Commission for Science and Technology and the salmon industry.

The Chilean Salmon Industry Association A.G. (SalmonChile) and the Technological Institute of Salmon (Intesal), which is the technical arm of the union, recently joined the international organization Global Aquaculture Alliance (GAA). "This – according to what was assured by SalmonChile – thanks to the work and efforts made in matters of sustainability and social responsibility that allowed the union and the more than 50 small, medium and large companies that make it up to join this network that promotes responsible aquaculture". Oceanic aquaculture will reduce conflicts with other users, increase sustainability levels and gain higher levels of social acceptance, given that its installation will only be in sectors that do not generate conflicts with other users and that one-way currents will reduce the prevalence of diseases. However, the difficulties in accessing the maritime resource are compounded by the growing rejection by the community of the operation and expansion of salmon farming in the territory. Communities have blocked the operation of companies in certain places, affecting production possibilities and the level of uncertainty they face. In the medium to long term, a bad relationship with the community, and with society in general, can translate into regulatory and legal changes that significantly impede the sector's action. Some examples of this are the unsuccessful attempts to relocate, the constant attempts to stop the expansion of the sector by different political and social groups or the difficulty in making the legal changes that allow the development of ocean aquaculture. For this reason, an alternative to the dilemma of how to grow is to regain and maintain trust and the social license to operate. A last relevant edge corresponds to the relationship with indigenous communities, given the special bond that many of these have with the territory. The so-called Lafkenche Law, in particular, can have a significant impact on the activity of the industry.

The current applications for Maritime Coastal Spaces of Indigenous Peoples (ECMPO) overlap with approximately 70% of the total aquaculture production area in Chile; and, currently, 41 aquaculture concessions in a state of renewal have been suspended since 2014 due to the preference given to the request of ECMPOs. The potential for conflict with indigenous communities can further damage the image and approval of the sector.

The boom in the industry has meant the occupation of important coastal areas with cage rafts for salmon farming, which have tended to diminish the attractiveness of the environment. The productive work of this industry implies truck traffic, death of native species, waste of blood water, aesthetically inappropriate facilities, change in the transparency of the waters, all of which is openly an aesthetic devaluation of the landscape. The installation of cage rafts in the coastal areas of southern Chile has been incorporated as a new element to the landscape, which has contributed to changing the historical image of these places, especially the Chiloe Archipelago. According to the officials of the salmon industry, this has been a contribution to the landscape and tourism as they have attracted more visitors. However, this version - clearly intentional should be supported in a technical, documented, and impartial way, since a contrary opinion is regularly expressed by locals and tourists, who consider the presence of cage rafts as a visual contamination, due to the profound transformation of the landscape they represent. Although the latter is not documented either, this rejection is as obvious as that manifested by any other type of contamination that alters the lifestyle and original landscape of sites affected by severe environmental impacts. On the other hand, the locals, who traditionally developed a mixture between small agriculture and artisanal fishing, have seen their extractive activity of coastal marine resources curtailed by the granting of aquaculture concessions that have reduced the surface of the coastal zone suitable for fishing operations.

To date, there is no study or antecedent that measures, quantifies and relates the effect of cage rafts on the landscape and on tourism, probably because the development of this last sector is subject to multiple factors, especially economic (exchange rate, general economic situation of the country, situation of neighbouring countries, etc.), and not only environmental.

As a way to mitigate the suspiciousness of the general public about farmed salmon and to promote aquaculture salmon, the Chilean salmon farming industry organizes several social and cultural events on a routine basis. The salmon national festival is an event that, year after year, brings together fishermen from all over the country to participate in the deepsea fishing contest that is the main attraction of the celebration. Every year the festival is a sporting event that has become a tourist attraction over the years.

Furthermore, there are a lot of gastronomic events in which farmed salmon is the key dish, as a way to promote the product and help to increase the social acceptability of the species. This kind of events attract a lot of tourists and are beneficial for the country's economy.

European campaign about aquaculture – #FARMEDintheEU

The European Commission set up the 'Farmed in the EU' campaign to promote fish farming and aquaculture products to European consumers, one of the objectives being to increase this activity as an alternative to traditional fishing. The European Union considers aquaculture a growth sector, which will create a significant number of jobs and is able to provide consumers with high-quality, healthy fish with sustainable production. This campaign was particularly addressed to schools and students, and to aquaculture farmers and to promote an exchange of experiences.

A great example of these promotion activities came from Spain. Spanish authorities, producer organizations and research institutes arranged open door visits and conferences across Spain to celebrate the annual "Día de la Acuicultura". This year, the European Commission joined in the celebrations, supporting the "Di sí a la acuicultura sostenible" ("Say yes to sustainable aquaculture") competition launched by the Observatorio Español de Acuicultura from Fundación Biodiversidad (MITECO).

As part of the campaign, the "FARMED in the EU"



Figure 11. Aquaculture's Day (Spain)

schoolkit developed by the European Commission was promoted to hundreds of schools across the country. To date, more than 1700 Spanish pupils from 37 schools and 27 aquaculture experts (producers, scientists, officials) have been involved in 62 workshops under the label #CRIADOenlaUE. The European Commission underlined the exemplary campaign carried out by the Spanish authorities, emphasising the sustainability of these "farmers in the water". In a video message, Commissioner for Fisheries and Maritime Affairs Karmenu Vella congratulated the organisers on the campaign's success, while emphasising the crucial role of teachers as the link between youth, science and industry.

Spain is the EU's number one in terms of aquaculture production (226,000 tonnes in 2013) and jobs (20,000 producers out of 85,000) and is among EU leaders in research.

Case study of social acceptability of Aquaculture in Monastir's bay: Tunisia

This study is part of the Project MedAID (Mediterranean Aquaculture Integrated Development) that is an H2020 European Project that bring together 32 partners from the research and aquaculture sector to increase the overall competitiveness and sustainability of the Mediterranean marine fish-farming sector, throughout the whole value chain. The "University of Bretagne Occidentale" and the research centre "Ifremer" that are partners of the "Technopole de Quimper" and "Investir en Finistère" take part in the project and led this study.

Monastir Bay is one of most important regions in terms of Aquaculture in Tunisia. This bay host 12 of the 20 active finfish farms of Tunisia. Finfish farm concessions have an area area of 15 to 80 hectares, on which 8 to 72 cages with a diameter of 22 to 25 meters are laid out. The total production capacity of all these farms is 15,490 tons. The vast majority of farms in the region are located in the port of Teboulba, which is now showing signs of saturation.

Aquaculture is not the only economic activity present in Monastir Bay. Fishing also plays an important role in the territory with six ports, including one deepwater port, which accommodates boats from inshore to offshore fishing. In contrast to aquaculture, the quantities landed by fishermen have sharply declined or stagnated in recent years for species such as cuttlefish, squid, octopus and king prawns. Monastir Bay is also an attractive touristic area. The bay is also an exceptional natural site. It is home to remarkable natural species especially in the Kuriat island that are protected.

Monastir's bay, the difficulties experienced by the stakeholders (fishermen, aquaculture, tourism...), precise interactions that exists on the territory and to do a diagnosis of social acceptability of aquaculture in the bay. 26 interviews have been carried out with the stakeholders of the bay (tourism sector, fishermen, aquaculture sector, administration, environmental association...) A workshop has been held and brought together 22 stakeholders of the bay. This workshop aim was to produce a shared knowledge of challenges generated by aquaculture development in the bay, analyses the possible impacts the aquaculture development and think about possible actions to reduce this impact.

The interviews results have shown that problems with aquaculture were due to:

- The fact the aquaculture benefit was not shared with the different stakeholders of the bay. Aquaculture products are eaten by local people and aquaculture businesses doesn't provide jobs to local people as people from other areas of Tunisia have been employed in the aquaculture farms.
- Aquaculture environmental impacts are a serious concern amongst local people but it's more how these impacts are managed by the local government that is a problem. Local people said that they want that the local government must do more to control the sector. There is a question of local governance behind this.
- Fishermen said that their activity should be more considered in the processes of aquaculture development. Fishermen complained that they were not involved in the mapping plan of the bay that regulate the activities of the bay.

With this different result the authors highlighted conditions of acceptability and thus some factors favouring the development of aquaculture projects.

- Participation to decisions: Enable stakeholders of the bay (fishermen, local population...) to take part in the decision process about aquaculture farms. This improves social acceptability.
- Lot of people interviewed have said that they wanted to take part in the installation stages of aquaculture farm
- It could improve the acceptance of aquaculture farm because it enable to every stakeholders to appropriate the project and be more favourable to it.
- It increases trust between stakeholders and enable stakeholders to feel more respected and considered.

Territory diagnosis: Ensure that the territory is adapted to aquaculture activities and adapt the project to territory's need/constraints.

- Taking into account social, environmental and economic aspects but also governance and value given by the public to the territory selected for aquaculture projects. In Monastir bay, it has been deplored that only economic aspects were taken into account and environmental and social aspects were forgotten.
- Identify synergies and incompatibilities of aquacultures with others sectors already present on the territory (for example with tourism, fishing) could improve acceptability of the project.
- Spatial planning with all stakeholders of the territory that shows where are and where will be located all the activities on the territory (fishing, tourism, houses, environmental concern...). In Monastir Bay local people regretted that the first aquaculture project hasn't been associated with the global planning of the bay.
Communication upstream and during the project: Inform people on the project about its positive and negative impacts.

- Inform people is important as the public will know if the project is good.
- In Monastir Bay, people said that they would like to be more informed and wanted feedback about the studies that are realised.
- It is very important that the people could react, explain their concerns and their point of views. It's also very important that these feedbacks are really taken into account by authorities.
- Communicate about negative or positive aquaculture impacts. In Monastir Bay many oppositions are related to negative impacts of aquaculture or the positive impact that are not well distributed.
- People will not support the project if they don't know its positive impact.

Political framework to ensure these processes:

- People want to be sure that a project like that would lead in a sure and responsible way.
- In Monastir's bay, lot of concerns were related to the fact the project will respect laws and regulations.

Breizh Mer: Social acceptability of Offshore windmills in Brittany

Christophe Chabert is responsible of the SME EOLFI that is specialized in floating offshore wind turbines. He presented in a conference, the social acceptability process that he implemented to install offshore wind turbines in the area of Groix Island. The social acceptability of this project was quite challenging as there is lot of fishing and touristic activities, there is also a high housing density on the coast. These factors could have increased a lot the local contestation of the project.

He summarized his social acceptability process with 3 points:

Anticipation, listening and transparency.

Anticipation: He started to anticipate this question of social acceptability very early in 2008 (so ten years before a possible installation). He consulted the fishermen organization in the area, local administration and local people to know where the best spot to install the wind turbines would with the best possible compromise. Christophe Chabert also said that transparency was a key when they negotiated and explained the project with local stakeholders. He said that they have been very transparent on their needs about the area they needed, they have transparent when they communicated on the project on the positive impacts and the possible negative impacts of the wind turbines implantation.

Listening is also a very important part of a successful social acceptability process. Christophe Chabert said that they listened the fishermen to understand the different issues the fishermen to adapt the project to them.

The last and very important measure that has been implemented is that Eolfi created a job dedicated to the social acceptability of the project. This job's aim is to communicate on the project, deal with local concerns, adapt to local and fishermen requirements. It has been seen that this has improved greatly the acceptability of the project.

As a result, the wind turbine installation project did not yet receive contestations and judicial remedy which is quite rare in the sector. In total more than 30 concertation meetings have been held with local stakeholders. Moreover, Eolfi created a touring exposition that presented the project locally to multiple information points to be as close as it can to local stakeholders' concerns.

Social acceptability on renewable energy project on the French Coastal Area

"Conflits et stratégies d'acceptabilité sociale autour des énergies marines renouvelables sur le littoral français». Annaig Oiry, 12/2015. PHD research study.

Installation of offshore wind projects share many similarities with the installation of aquaculture farm

projects: both need to be installed in coastal areas that are usually already characterized by multiple uses (weight of professional fishing sector with major fishing ports, importance of the tourism sector, environmental issues, local people concerns, etc.). Actions that have been implemented to improve the social acceptability of the offshore wind turbines give information about social acceptability of economic activities in coastal areas.

This document presents the results of a study that analyses strategies undertaken by industrial groups to improve the social acceptability of the installation of 2 offshore wind turbines parks (wind turbine park of Saint Nazaire Bay, Wind turbine park of Saint-Brieuc bay) and 2 water Turbines Park (Water turbines park of Paimpol-Brehat and Water Turbine park of Raz de Blanchard, Normandy). All of these projects have been accepted and received an authorization from the government between 2015 and 2019.

This study has been made as a part of a PHD research study made by Annaig Oiry, Université Paris 1, Panthéon- Sorbonne, laboratory of physical geography.

Three main survey techniques were selected to carry out this research: the practice of semi-directive interviews, observation during marine renewable energy promotion fairs, and the constitution of documentary corpuses. Sixty interviews were conducted with a variety of stakeholders: users of the sea (fishermen, nautical activities), the local population (main or secondary residents), local associations, local authorities (mayors of municipalities and inter-municipalities), project leaders (also referred to as techno-industrial groups in this article), those responsible for and organisers of consultation procedures (consultation agencies, members of special commissions for public debates), public decision-making bodies (Directorate General for Energy and Climate).

Different categories of opponents seem to be distinguishable: the residents, environmental associations, and the fishing world.

The reasons used to justify a position against marine

renewable can be grouped into four types: arguments mobilizing the problems of the living environment, arguments arising from a criticism of consultation procedures, arguments of a socio-economic (job losses) nature and, finally, arguments based on environmental issues. These raisons can be compared to the ones that the professionals of aquaculture face when they want to install new aquaculture farms even if the economical dimensions are different between wind turbine farm and aquaculture farm installation.

Manage conflict with social acceptability's strategies

The following text presents different activities that have been undertaken to improve social acceptability of the project amongst the local people:

Industrials that carry Wind Turbine farms projects develops social acceptability strategies upstream the project to assess the probabilities of its appropriation in order to limit the risks of possible rejection, repositioning the project or the technology itself if necessary. Windfarms project leaders are thus led to carry out real work on social acceptability, conceived here as a way of obtaining the consent of civil society. Industrials create communication strategies that aims to make this new infrastructure desirable for the local people.

Create "Consultation events" to improve the social acceptability of the projects:

Industrials that are responsible of the installation of offshore wind turbines or water turbine project, highlight the fact that their projects are concerted and that they have created a close dialogue with the local inhabitants. For them, consultation takes place through different types of initiatives such as the local consultation, meeting with a "monitoring body" (that is a group of local actors of the political, economic and environmental which meets regularly to follow the progress of the project), as well as public debate about the project. Public debates enable industrials to pass on information and to consult local stakeholders. Public debate is also an opportunity to implement various communication strategies to achieve acceptance of their energy infrastructure.

Project leaders sometime hire professional agencies of council, communication and concertation to support them in the concertation processes:

These agencies use a precise methodology to prepare the public debate and to try to improve social acceptability of the project that consist in:

A territorial analysis of the selected site: this consists of a documentary analysis and a context study based on interviews with the local people in the territory. This first study is used to identify the people who have potential concerns on the project, to study their discourse, to question the local stakeholders on their expectations regarding the consultation process and to evaluate the image that the local people have of the project. This will have to support the industrials to prepare solid argument for the public concertation events. The agency prepares the debate by helping the project owner to draw up the project presentation file. The agency also organises sessions to prepare project leaders for public speaking by providing coaching and media training sessions. They can also organize convivial events where all stakeholders are invited such as aperitif of presentations of the projects.

Negotiating marine renewable energies presence projects through compensation:

Compensation can be defined as the allocation to a territory suffering the negative impacts of a development declared to be of public utility, of a set of measures aimed at improving its acceptability. Several types of compensation can be made within the framework of energy projects: financial compensation (which takes the form of direct or indirect financial compensation), environmental compensation (restoration of destroyed resources, re-establishment of species, classification of another territory as a protected area in compensation for the equipment of the first, etc.) or accompanying measures (financing of ancillary activities). In the aquaculture sector, this could be carried out with the organization of the professionals of aquaculture or the local/regional authority.

The fishing industry is particularly involved in these negotiations on compensation as fishing areas could be reduced with this kind of projects. During the construction phase of the installation of the first tidal turbine off the island of Bréhat, on the north coast of Brittany, some fishermen, those whose fishing area was temporarily inaccessible, were financially compensated. Measures for investment in public goods were also envisaged, including the financing of refrigerated lobster tanks (for the Saint-Brieuc offshore wind farm and the Paimpol-Bréhat tidal turbines), as well as ecological restoration actions: campaigns to combat the crepidule (a larva whose high densities prevent the recruitment of scallops), shell reseeding campaigns, immersion of artificial reefs to attract fish, etc. creation of specific jobs for fishermen wishing to engage in the maintenance of offshore wind farms.

The use of local taxation for acceptability purposes

The Windfarms project leaders have set up a tax on maritime wind turbines collected by different actors in the territory. The tax is divided as follows: 50% for the coastal municipalities from which the wind turbines will be visible, 35% for the National Committee for Fisheries and Marine Breeding and the remaining 15% is dedicated to funding contributing to the sustainable development of other maritime activities. The sums involved are not negligible since they amount to approximately seven million euros per year and per park. The wind tax is an essential modality for the acceptability of mayors of municipalities. For elected officials, one of the determining factors in their acceptability of MRE (Marine Renewable Energy) projects is the issue of local development. Most elected municipal officials and members of local authorities have positions that are rather favourable to the various projects studied, because they see energy transition projects as vectors of local development creating a new economic sector on the territory.

Here the strategies undertaken by Industrials to improve the social acceptability of their wind turbines farm are more related to seduction and sometime manipulation strategies to convince local stakeholders to accept the project. There is here an important difference with the "social acceptability" that is meant to be co-constructed with the different stakeholders of a project.

3.3 Increasing Social Acceptability: Strategy, Methodology and Road Map for future development

Contemporary research demonstrates that populations in different countries reveal significant and different consumer preferences, attitudes, and a broader cultural relationship with seafood. The concept of social acceptability concerning the aquaculture sector faces different challenges not only from country to country but also across and within different regions within each country. The social acceptability strategy developed under Access2Sea intends to present a list of strategies that can resonate with stakeholders in different countries. Access2Sea aims to contribute in a tangible and verifiable way to the changing of public opinion and prevailing attitudes. The programme also seeks to promote the social acceptance of aquaculture by clearly recounting the benefits of aquaculture's production processes and the products which it delivers to the market. This strategy was created by highlighting actions which highlight the sector's sustainability and the importance of fish consumption.

Social acceptance methodology and road map

Different countries have different consumer preferences, attitudes, and cultural relationship with the seafood systems. Social acceptability of aquaculture faces different challenges not only from country to country but also in different regions within each country. This strategic plan intends to present a list of strategies that can resonate with stakeholders in different countries, and which may be tested in the future.

For this reason, the object of this plan should address the overarching challenge towards the aquaculture industry especially where there is a perceived danger to or conflict with other sectors of the economy such as tourism or the environment. For this reason, education is key in the long term seafood is affordable, consumers who understand seafood eat seafood and tend to have a better view of the industry. Therefore, the plan should be aimed at appealing to policy-makers which appears to be where prejudices towards the industry have the greatest effect.

An effort to demystify some of these misconceptions and promote aquaculture products as high nutritional value, high quality, easily available, highly controlled, healthy and safe food, should be done.

Current situation

Spain

A questionnaire carried out aboutAquaculture in Andalusia showed a generally positive



perception. Respondents pointed out the availability of fresh and healthy products during all the year, for an accessible and steady price as well as the lower risk of contamination and higher sanitary controls comparing with products from wild fisheries. They also mentioned the potential of the sector to provide employment opportunities in Andalusia, and its contributions for supporting regional economic growth. Respondents expressed concerns regarding low levels of R&D and the lack of financial support from the administration for an adequate development of the sector.

Despite of the apparent social acceptability of aquaculture among the respondents of the questionnaire, this represents only a small portion of the population (38 respondents) and may be biased towards those with prior knowledge of (70% of the respondents) and/ or experience in the sector.

Ireland

The consultation of stakeholders carried out previously (WP5 - Action 1) showed the following:

Although there had been a reduction in the number of businesses operating in some sectors of Irish aquaculture from 2009 to 2018, aquaculture activities are very important to sustain the employment and livelihoods of the people in Ireland.

There are good conditions for aquaculture production: nutrient rich waters and suitable sheltered bays; production techniques are environmentally sustainable.

The sector has significant weakness such as: delays in licensing processes Insufficient investment in R&D and Insufficient product availability to meet market demand.

In terms of opportunities, stakeholders highlighted the importance of the sector for employment in coastal communities, the significant export potential and global demand for high-quality seafood.

As threats they considered: fish diseases and parasites, the co-existence with other marine activities, and public opposition to industry, among others.

France

Aquaculture is viewed by professionals as being an important sector in the regional economy in terms of employment capacities and also for cultural aspects. However, interviewees considered that the majority of citizens have little knowledge on aquaculture and maritime issues in general.

All the interviewed stakeholders considered spatial conflicts as being the major barrier to aquaculture development.

Regarding issues on water quality, aquaculture in Brittany does not seem to have a negative impact even though local citizens seem to lack of knowledge on this topic. Finfish aquaculture is too limited to have any impact on the environment in this region.

In order to limit social conflicts and visual intrusion stakeholders explained that the sector must work in cooperation with other areas such as the fisheries industry, marine renewable energies and tourism.

Aquaculture in Brittany concerns mainly the production of shellfish such as oysters and mussels. Companies remain very small, only a few of them are considered as big groups. The consumption of these products remains limited as they are not considered as being edible products of the daily life. Most of consumers buy these products for exceptional events such as over the Christmas and new years' eve period.

To conclude, the aquaculture sector in Brittany, concerning mainly shellfish culture and composed of small companies, lacks visibility at regional level. However, opportunities exist to increase social acceptability such as the development of tourism or recent consumers trends, consisting of consuming products from the local level.

Portugal

Portugal is by far the main fish consumer inside the EU 27 with 56.9 kg per capita/year, while the EU average is 21.4 kg/ head/year. However, Portuguese consumers are sceptical about aquaculture. This might be related with unconstructive messages, commonly spread among consumers, which result in the preconceived idea that seafood from aquaculture is generally of a worse quality compared to wild fisheries. Vast improvements in the public image of the aquaculture sector need to be undertaken. Stakeholders have the huge challenge of clarifying consumers about the positive aspects of aquaculture products and in the demystification of several erroneous ideas.

A huge marketing effort should be made near consumers in order to distinguish between products from different origins and to promote extensive and semi-intensive fish as high-quality goods. New niche markets to these highquality products should then be created and explored, in terms of domestic market but also to export. Still, Portuguese consumers are very skeptical concerning aquaculture products. An effort to demystify some of these misconceptions and promote aquaculture products as high nutritional value, high quality, easily available, highly controlled, healthy and safe food, is urgent.

United Kingdom / Wales

The contribution of aquaculture to the economies of England, Wales and Northern Ireland is modest; but it is diverse, spread widely across all three countries, closely associated with quality seafood and aquatic products important to the image of some regions, and locally important in rural areas. Aquaculture produces healthy seafood, with opportunities for growth that do not exist in capture fisheries. Indirectly aquaculture makes a substantial contribution to healthy recreation and leisure for millions of people through countryside visits, angling and ornamentals.

However, seafood is not very popular in the UK. Consumption is low (19.73 kg/ capita) in comparison with other European countries (average of Access2Sea countries is 35 kg/capita; data from 2017, OWID). According to the UK government's Department for Environment, Food, and Rural Affairs (Defra), the average person in Wales eats 145.9 grams of seafood per week (7.6 kg/capita/year), which is lower than the UK average of 152.8 grams per person per week. Fish is served at UK schools only once a week, often as an option.



UK seafood consumption 19.73kg/capita per year



European seafood consumption 35kg/capita per year



Access2Sea Social Acceptance Strategy: Mission and Vision

Taking into consideration that

- Aquaculture has the potential to boost economic development and job creation especially in the seafood sector by the sustainable exploitation of the Atlantic area assets;
- Currently only 10% of Atlantic shore seafood is aquaculture-sourced;
- And the public opinion on aquaculture products is still affected by several misconceptions and lack of information on aquaculture, directly affecting its social acceptance.

We wish to contribute for the change of public opinion, promoting aquaculture social acceptance, by informing and showing the benefits of aquaculture's processes and products, through actions that show its sustainability, the importance of fish consumption and, very importantly, compare the different types of protein production for human consumption, so that society will understand that the production of high-quality protein and low ecological damage involves the development of aquaculture. We foresee a living society, in the Atlantic area, that consider aquaculture the most sustainable way to obtain high quality protein, affordable and safe.



Strategic Objectives and Action Plan 2022

Taking into consideration economic aspects, environmental aspects, and governance aspects three strategic objectives were defined. For each strategic objective (S.O), lines of action were defined (LoA). For each line of action, is presented a roadmap for its implementation and indicators.

S.O. 1

To improve the social acceptance of aquaculture through a better consumer response to its products (high-quality protein at an affordable price) and to the activity itself (job creation, type of contract, salary, etc.), and by strengthening the market for aquaculture products (marketing, quality / sustainability certifications). (Economical Aspects)

LoA 1.1

Regional campaigns for changing the image of aquaculture fish within the consumers

Description:

In most of the countries fish from aquaculture is not well seen among consumers. In some cases, they are not considered having the same quality as the fish from wild captures and in other cases they are considered "ugly fish" and seen as not good.

Regional marketing campaigns are launched to promote "ugly fish" and fish from aquacultures using "posters" shown in supermarkets and fishmongers (fish markets), and also through social media. In addition, public events are held, involving restaurants or chefs who will create meals that use these fishes.

Roadmap:

- Existing information (videos and other contents) about the positive outcomes of eco-systemic aquaculture is collected;
- Meetings with producers are held in order to select the elements to showcase in the marketing campaign;
- Based on the information previously collected, key messages are defined;
- 4) A business designer to create a common image

for the regional campaign and to design the layout for posters and videos is recruited;

- 5) Communication materials are disseminated to local communities and to common public, in public events;
- Prestigious chefs are invited to create meals that use "ugly fish" and fish from aquaculture;
- 7) Show cooking events are held.

Indicators:

- Number of campaigns designed: 1 per region;
- Number of meetings with producers: 2 per region;
- Number of designers hired: 1 per region;
- Number of posters created: 5 per region;
- Number of videos produced: 5 per region;
- Launching campaign event: 1 per region.

LoA 1.2 Online training: Say YES to sustainable aquaculture

Description:

Most consumers don't know how to differentiate between farmed and wild products when purchasing seafood and are unaware of the information contained in food labels, which is important to make sustainable food choices. Also information is not given to consumers about aquaculture production methods. Therefore, an online training targeted to consumers on subjects as how to read labels, aquaculture productions methods and similar items will help to provide a better social acceptance of aquaculture to general public. The online training can include short videos, fact sheets, etc.

Roadmap:

- 1) The different aquaculture methods relevant to Access2Sea countries are identified and resumed;
- 2) The structure of the online content is defined;
- Contents for the online training (written, audio, video) are created;
- 4) Storyboard for the videos are written;
- 5) Following storyboards, video capture on site are made;
- 6) Videos are edited;

7) Videos are published on YouTube channel.

Indicators:

- Number of training courses: 1;
- Number of sets of educative videos in EN, posted on YouTube: TBD;
- Number of viewers in YouTube.

S.O. 2

To improve the social acceptance of aquaculture using socially responsible techniques and ecologically sustainable (cultivation of organisms with low trophic levels, use of non-polluting materials), as well as their dissemination. (Environmental Aspects)

LoA 2.1.

Application of existing tools for sustainable development of the aquaculture sector

Description:

Based on the inventory of SME that has been carried out within the framework of the project companies from each region will choose one or more of the tools for sustainable development of the aquaculture sector to implement, during a given period. After the implementation period the results are shared and ranked, according to their feasibility and efficiency. Accordingly, a set of selected measures is settled in a document of Policies Recommendations and transmitted to the public administration, in each region.

Roadmap:

- The inventory of SME that has been carried out within the framework of the project is reviewed and updated with the results that came from the Access2Sea pilot projects;
- The companies included in the inventory are classified according to the type of production (extensive, intensive, semi-extensive, semiintensive, semi-intensive);
- Each company is asked to fill in a form indicating the environmental monitoring plans they have and the environmental protection measures they carry out;
- The identified measures are shared with the rest of the regions in order to improve their own actions;

- 5) Companies, from each region, agree on carry out these measures, during a given period and transmit the results to the partners;
- 6) The results are shared with the partners;
- 7) Participatory workshops are held, involving the companies, the partners and local authorities in order to rank the measures in order of importance/ interest and to evaluate the feasibility of carrying them out;
- 8) A formal proposal with the selected measures is submitted for consideration by the governments, in each region, through producer's associations or other appropriate channel in each region.

Indicators:

- Number of participant companies: 5 per region
- Number of tools applied: 3 per region
- Number of proposals with Policies Recommendations: 1 per region

LoA 2.2.

Fish welfare online tools for improving aquaculture social acceptance

Description:

Farm profitability and welfare are linked. To tackle the welfare of cleaner fish in salmon farms Swansea University has developed lumpfish welfare diagnostic tools, which will be available online through the lumpfish welfare tracker website. The tools include a Lumpfish Weight Watchers (body mass index), a lumpfish welfare diagnostic calculator and an e-learning course on lumpfish welfare. The e-learning course and respective online tools will be provided to producers.

Roadmap:

- 1) Stakeholder Consultation;
- Workshop to train farmers on how to use the online tools;
- 3) Develop a quality assurance;
- Assess and evaluate the impact of the welfare tools.

Indicators:

- Number of trainees: 10;
- Number of evaluation forms: 10;
- Number of website views: 150;
- Number of articles in specialized journals: 2.

LoA 2.3. Communicating sustainable aquaculture through comics

Description:

Comics are a popular form of communication, able to engage readers of all age groups and cultural backgrounds. Visual narratives, such as comics and animations, are becoming increasingly popular as a tool for communicating complex topics, such is aquaculture. Aquaculture can be demystified by breaking down its components and telling different stories using comics.

Roadmap:

- 1) An author for comics is selected and hired;
- The key concepts to be disseminated are defined by partners (examples: what is aquaculture, what is fisheries, how do we farm – different sea products, ...);
- The author is involved to develop a setting that graphically ties important concept element, to create characters and a detailed storyboard;
- A marketing campaign is defined and implemented;
- 5) The story is translated;
- 6) A book video trailer is published, as example of other trailers;
- 7) Print books are published in different languages;
- Audiobook with sign language can be considered (depending on the available budget);
- 9) The impact is evaluated.

Indicators:

- Number of printed books distributed: 120 per country;
- Number of PDF downloaded: 200;
- Number of social media engagements: 200;

S.O. 3

To improve the social acceptance of aquaculture through the support of the administration to the companies, in terms of bureaucratic efficiency (commitment to shorten the time of resolution of procedures) and legal certainty (concession time, aquaculture insurance). (Governance Aspects)

LoA 3.1.

Technical workshops about removable installations and offshore aquaculture installations

Description:

These workshops are focused on technical aspects of aquaculture installations and bring together aquaculture producers' unions, experts of the regulations in coastal areas, administrations and political representants to think about new possibilities of using maritime space for aquaculture. Technology experts of the offshore aquaculture installation and removable aquaculture installation are invited to present their technologies. Examples of subjects to be addressed:

- Is "removable" aquaculture feasible?
 - What would be their advantages in terms of regulations, techniques?
 - How to occupy new spaces in coastal areas in an innovative way?
 - How the use of removable aquaculture installation could be an opportunity to install aquaculture installations?
 - Regulation and technical advantages, disadvantages....

Roadmap:

- 1) Specific subjects are defined;
- The target audience is defined: aquaculture producers' union representants, researchers in aquaculture, aquaculture producers, technical experts of the technology (removable installation, offshore purification installation...);
- 3) Technical workshops are scheduled;
- 4) Speakers are invited;
- 5) Technical workshops are disseminated via emails and media;

6) Technical workshops are organized and held.

Indicators:

- Number of Technical workshops: 1 per region;
- Number of participants in each regional TW: 50.

LoA 3.2.

SME Support for business development, planning and licensing

Description:

SME support provided by intermediary liaising between planning and licensing authorities and SMEs. This support includes business development in the context of single bay management, planning and licensing regulations.

Roadmap:

- Identify professionals to act as intermediary liaising officers, giving support to the aquaculture producers in business development, planning and licensing regulations;
- Attendance of aquaculture producers or SME (during a year);
- 3) Elaboration of Business Plans and assistance to obtaining licenses.

Indicators:

- Number of SME liaison support offices: 1 per region;
- Number of producers/SME attended: tbd;
- Number of Business Plans: 5 per region;
- Number of Licenses obtained: 3 per region;

LoA 3.3.

Jointly definition of fiscal benefits for sustainable aquaculture production, in collaboration with companies

Description:

An effective way of inducting companies to adopt social or conservation measures is through the application of tax advantages or social benefits, such as, for example, social security bonuses. The first step would be to identify what kind of bonuses would be of interest to companies and then to check the feasibility of these measures with the administration. This will be done in a participatory way.

Roadmap:

- In each region participatory workshops with the companies are carried out in order to identify which kind of governance measures could be interesting for them, in case they adopt extra measures for the protection of the environment and sustainable development.
- 2) Results are shared between the partners, in order to contribute from others scenarios point of view.
- The contributions from partners are returned to the companies in order to reevaluate and to rank them in order of importance/interest.
- Audiences with local administrators are carried out, to show them the proposals and to evaluate the feasibility of their application.
- 5) A formal proposal with the selected fiscal benefits is submitted for consideration by the governments, in each region, through producer's associations or other appropriate channel in each region.

Indicators:

- Number of participatory workshops: 2 per region (identification and raking of benefits; 2) proposal for its implementation to Public Administration);
- Number of formal proposals to Public Administration: 1 per region;
- Number of audiences with Public Adm: 1 per region.

Strategic Objectives and Action Lines

The table below presents the action lines per Strategic Objective and related indicators.

	Lines of Action (LoA)	Indicators (for 1 year 2002)	Partners
S.O. 1 ECONOMIC ASPECTS "to increase sales and producer's revenues	 Regional campaigns for changing the image of aquaculture fish with the consumers Online training to consumers "Say Yes to sustainable aquaculture" 	 Nb of campaigns designed: 1 per region Nb of meetings with producers: 2 per region Nb of designers hired: 1 per region Nb of posters created: 5 per region Nb of videos produced: 5 per region Launching campaign event: 1 per region Nb of training courses: 1 Nb of sets of educative videos in EN, posted on Youtube: TBD Nb of viewers in YouTube 	France; Spain UK France
S.O. 2 PRODUCTIVE AND ECOLOGICAL	1. Application of existing tools for sustainable development of the aquaculture sector	 Nb of participant companies: 5 per region Nb of tools applied: 3 per region Nb of proposals with Policies Recommendations: 1 per region 	France; UK, Ireland
ASPECTS	2. Fish welfare online tools for improving aquaculture social acceptance	 Nb of trainees: 10 Nb of evaluation forms: 10 Nb of website views: 150 Number of articles in specialised journals: 2 	UK
	3. Communicating sustainable aquaculture through comics	 Nb of printed books distributed: 120 per country Nb of PDF downloaded: 200 Nb of social media engagements: 200 	
S.O. 3 GOVERNANCE ASPECTS	1. Technical workshops about removable installations and offshore aquaculture	 Nb of technical workshops: 1 per region Nb of tools applied: 3 per region Nb of proposals with Policies Recommendations: 1 per region 	France;
	 2. SME support for business development, planning and licensing 3. Jointly definition of fiscal or social benefits for sustainable aquaculture producers 	 Nb of SME liaison support offices: 1 per region Nb of Producers/SME attended: Nb of Business Plans: 5 per region Nb of licenses obtained: 3 per region Nb of participatory workshops: 2 per region benefits: 2) implementation to Public 	Spain
		 Nb of formal proposal t Public Administration: 1 per region Nb of audiences with Public Adm: 1 per region 	Portugal

Concluding comments

According to the European Commission, aquaculture is among those maritime sectors contributing to the blue economy due to its potential for generating jobs, business opportunities and, most importantly, for ensuring food security in Europe. In 2014, EU member states set new strategies to support sustainable aquaculture and ambitious targets of productions to be met by 2020 in the three segments, marine fish, freshwater fish and shellfish.

A recent assessment made by the European Commission concludes that some countries might not be able to attain the established goals and this paper presents an in-depth analysis of such strategies to identify the social constraints hampering aquaculture growth in France, Italy and Spain as well as the measures established to overcome them. Most of the identified issues are related to the social acceptability of local communities, local stakeholders and consumers, suggesting that this still represents an unsolved issue hampering aquaculture development in Europe. In fact, results show that

- (a) the sector suffers from a bad image related to its environmental impacts;
- (b) a lack of integrated spatial planning is leading to increasing conflicts with other activities; and
- (c) there is predominance of top-down consultation mechanisms.

There is not a single solution to enhance social acceptability of aquaculture since this depends on a number of social, economic and environmental factors that may differ from site to site, and countries need to adopt a more integrated approach where concerns of local communities and stakeholders are understood and taken into account.

Social acceptability of aquaculture still represents an unsolved issue despite the efforts made by the European Commission, the FAO and Member States to enhance it. The complex and rigorous legislative framework that ensures an environmentally sustainable aquaculture along with healthy seafood has not guaranteed the acceptance of the sector by the local actors where aquaculture is developed and by consumers. From the analysis of the three countries, national reports have emerged that the most relevant environmental regulation is applied, while many differences have been found in the strategies set to improve communication and to establish public participatory programmes. In this context, a long-term commitment to educational projects and medium-short-term investment in media literacy projects can contribute to building a more favourable path than the current context of stagnation and contestation.

There is not a single solution to enhance social acceptability of aquaculture and administrations, aquaculture producers and citizens should collaborate in the development of national and regional strategies under a more integrated perspective, taking into consideration environmental, economic, social and governance related aspects. On the other hand, local and regional administrations need to develop the capability and the tools to recognise when a further aquaculture development is likely to deteriorate the social and economic well-being of their communities.

Further Information on Social Acceptance papers completed as part of the Access2Sea project is available here: https://access2sea.eu/pages/ documents/#toggle-id-4 Creating Tools for Development and Economic-Financial Planning Interventions in support of Business Models in the Aquaculture Sector

4.1

Overview of Aquaculture Producers in the Atlantic Area

During the period August to September 2019, the Partner Organisations of the Access2Sea Project prepared an inventory of aquaculture producers for each of their regions. All data collected is regional data, and each partner has determined the geographical boundaries of its region. This inventory was analysed by a range of criteria including size of company, legal structure, main business activity and primary species. A summary of the analysis by Partner Region is outlined below and is followed by a comparison of the data by Partner Region.

Welsh Region

A total of 38 aquaculture producers were identified by the Welsh Partner of the Access2Sea Project. The largest group of companies (37%) were micro companies i.e. companies with <10 employees. More than half of the companies were identified as Limited Companies.

Production was identified as the main business activity for more than half the companies in the group (53%).

The primary species was quite varied across the group, with the highest number of companies identifying Bottom Mussel as their primary species (7 No. companies or less than 20% of the group).

Andalucía Region

A total of 69 aquaculture producers were identified by the Andalucían Partners of the Access2Sea Project. The largest group of companies (60%) were micro companies i.e. companies with <10 employees. Just less than half of the companies identified were established as Limited Companies (45%).

Production was identified as the main business activity for 18 companies in the group (26%) and Wholesale & Retail Trade was identified as the main business activity for eleven companies (16%). More than half the companies in the group (54%) identified Varied as their Primary Species with 38% of companies identifying Gilt-Head Bream and 26% identifying European Seabass as one of their primary species.

Irish Region

A total of 287 aquaculture producers were identified by the Irish Partners of the Access2Sea Project.

Company size was not identified for the companies in this group. More than half of the companies in the group (63%) were identified as Limited Companies. Production was identified as the main business activity for 221 companies in the group (77%). Trestled Oyster was identified as the primary species for largest cohort of companies in the group, 170 in total (59%).

Portuguese Region

A total of 41 aquaculture producers were identified by the Portuguese Partners of the Access2Sea Project. Six companies (15%) were identified as micro companies i.e. companies with <10 employees and two as SMEs (5%). Size was not identified for the remaining companies in the group. More than half of the companies identified were established as Limited Companies (59%). Production was identified as the main business activity for 26 companies in the group (63%). Native Oyster was identified as the primary species for eight companies in the group (20%). This was the largest number of companies in the group to identify the same species as their primary species in the data supplied.

Brittany Region

A total of 186 aquaculture producers in Brittany were identified by the French Partners of the Access2Sea Project. The largest group of companies, 177 in number (95%) were micro companies i.e. companies with <10 employees.

The largest cohort of companies in the group, 141 in total (76%), were identified as Limited Companies.

Production and Commercialisation was identified as the main business activity for 106 companies in the group (57%). Gigas Oyster was identified as the primary species for 120 companies in the group (65%).

Trestled Ostyers



Comparison by Partner Regions

The following four Tables give a comparison of the data collected by Partner Regions across the criteria of Company Size, Business Model, Main Business Activity and Primary Species.

Table	1:	No.	of	Companies	by	Company	Size
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Partner Region	Micro	SME	Large	Size Unidentified	Total
Welsh Region	14	9	3	12	38
Andalusian Region	42	11	0	16	69
Irish Region	0	0	0	287	287
Portuguese Region	6	2	0	33	39
Brittany Region	177	8	1	0	186

Table 2: No. of Companies by Business Model

Partner Region	Sole Trader	Limited Company	Partner- ship	Co- operative	Other	Business Model Unidentified	Total
Welsh Region	0	22	1	0	2	13	38
Andalusian Region	21	31	2	0	0	15	69
Irish Region	92	181	6	6	2	0	287
Portuguese Region	5	24	5	1	0	6	41
Brittany Region	37	141	4	3	0	1	186





Table 3: No	of	Companies	by	Main	Business	Activity
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Partner Region	Production	Production & Processing	Production & Commer- ialisation	Production Processing & Commer-	Other	Main Business Activity Unidentified	Total
Welsh Region	8	4	7	1	7	11	38
Andalusian Region	3	0	11	4	11	40	69
Irish Region	221	0	66	0	0	0	287
Portuguese Region	8	9	12	6	2	12	41
Brittany Region	55	4	106	15	4	2	186

Table 4: No. of Companies by Primary Species

Partner Region	No. 1 Primary Species (No. of Co's)	No. 2 Primary Species (No. of Co's)	No. 3 Primary Species (No. of Co's)	Other / Varied (No. of Co's)	No Main Species Identified (No. of Co's)	Total (No. of Co's)
Welsh Region	Bottom Mussel (7 Co's)	Freshwater Trout (4 Co's)	Hatchery Lumpfish (3 Co's) Aquarium Fish (3 Co's)	Other / Varied Species (12 Co's)	No main species identified (9 Co's)	38
Andalusian Region	Mussels (6 Co's)	Gilt Edge Bream (5 Co's)	Microalgae (2 Co's) Japanese Carpet Shell (2 Co's)	Other / Varied Species (44 Co's)	No main species identified (10 Co's)	69
Irish Region	Trestled Oyster (170 Co's)	Rope Mussel (58 Co's)	Bottom Mussel (26 Co's)	Other / Varied Species (32 Co's)	No main species identified (1 Co)	287
Portuguese Region	Native Oyster (8 Co's)	Gigas Oyster (1 Co)	Rope Mussel (1 Co)	Other / Varied Species (1 Co)	No main species identified (30 Co's)	41
Brittany Region	Gigas Oyster (120 Co's)	Rope Mussel (16 Co's) Native Oyster (16 Co's)	Freshwater Trout (9 Co's)	Other / Varied Species (18 Co's)	No main species identified (7 Co's)	186

Further Information on Business Models papers completed as part of the Access2Sea project is available here: https://access2sea.eu/pages/documents/#toggle-id-5

4.2

Inventory of Regulatory and Legislative Frameworks for Licensing New Aquaculture Farms (onshore and offshore) in the Atlantic Area

Introduction

As part of the programme of work included in Work Package Six of the Access2Sea project, Action Two involved Project Partners undertaking to characterise the project territory's regulatory and legislative frameworks for licensing new aquaculture farms in the Atlantic Area (onshore and offshore). The objective of this Action is to facilitate data comparison across the participating regions and to highlight best case models in regulatory and legislative frameworks.

Project Partners from each region in the Access2Sea project collected the following information relating to the regulatory and legislative environment in their own region:

1. Policy Context for Aquaculture Regulation

2. Analysis of Socio-Economic Impact on Coastal Communities

- 3. Legislation and Regulations
- 4. Regulatory Agencies and their roles
- 5. Licensing Application Process

6. Identification of Best Practices in regulation and licensing

7. Related Scientific Publications

Welsh region

Partner: Swansea University **Country**: United Kingdom

1) Policy Context for Aquaculture Regulation

The following are the key policies governing aquaculture regulation in Wales

 The Welsh National Marine Plan (Draft) is the first marine plan for Wales. Its purpose is to guide the sustainable development of the Welsh marine area by setting out how proposals for use will be considered by decision makers including, in particular, consenting authorities.

- Well-being of Future Generations (Wales) Act 2015. The Future Generations Commissioner for Wales' role is to act as a guardian for the interests of future generations in Wales, and to support the public bodies listed in the Act to work towards achieving the well- being goals.
- Habitats Regulations Assessment Report enables the Welsh Government to meet its obligations under the Habitats Regulations. It documents the assessment of the WNMP against the requirements of the Habitats Regulations, summarising the HRA process and its application to the WNMP, and detailing the results of the assessment.

2) Analysis of Socio-Economic Impact on Coastal Communities in Wales

The contribution of aquaculture to the economies of England, Wales and Northern Ireland is modest; but it is diverse, spread widely across all three countries, closely associated with quality seafood and aquatic products important to the image of some regions, and locally important in rural areas. Aquaculture produces healthy seafood, with opportunities for growth that do not exist in capture fisheries. Indirectly aquaculture makes a substantial contribution to healthy recreation and leisure for millions of people through countryside visits, angling and ornamentals.

The UK fish and seafood market is currently dominated by imports (43 per cent) and capture fisheries (40 per cent) with aquaculture making up only 17 per cent of domestic supply (Jennings et al. 2016).

The main export markets for UK salmon are the USA (34 per cent), France (23 per cent) and China (12 per cent). Aquaculture in Wales is worth £11.8m (2017, where shellfish play a key role generating £8.6m gross value added,

A report published in 2017 by the Government Office for Science entitled "The future of the sea: trends in aquaculture", states that Aquaculture has considerable social benefits: for example, Scottish aquaculture production generates at least £1 billion in turnover across the UK and supports 8,800 jobs. This report highlights that there are relatively few studies on public attitudes to aquaculture development but those that have been undertaken do not point to a widespread antipathy to aquaculture (Whitmarsh and Palmieri 2009; 2011), especially when appropriate information is provided (Altintzoglou *et al.* 2010; Chu et al. 2010). In Wales the general sentiment towards aquaculture seems to be more positive than in the UK, based on a study assessing newspapers headlines sentiment (Froehlich *et al.*, 2017)



Figure 2.1: Newspapers aquaculture media sentiment, based on headlines negative (red), positive (blue), and neutral (grey) adapted from Froehlich et al.(2017).

This may be explained by the fact that the Welsh seafood industry is dominated by two key characteristics which makes it different from the rest of the UK. Firstly, the industry is based on shellfish, not finfish. Secondly, most exports are live, unprocessed and almost exclusively to the EU market; with almost no preservation or processing capability. The Welsh seafood sector is characterised by micro and small businesses which are important to coastal communities. This also means the possible impacts of Brexit on fisheries and aquaculture trade, are different to and arguably more significant, than elsewhere in the UK. Welsh Government is working with the UK Government to try to mitigate the impact of Brexit on the Welsh shellfish and aquaculture industries.

3) Legislation and Regulations in Wales

The following lists the main legislation and regulations governing aquaculture in Wales

• The Marine and Coastal Access Act 2009 is an Act of the Parliament of the United Kingdom that creates a new marine planning system including marine conservation zones and improved management of inshore fisheries

- The Planning Act 2008 is an Act of the Parliament of the United Kingdom to establish the Infrastructure Planning Commission and make provision about its functions; to make provision about, and about matters ancillary to, the authorisation of projects for the development of nationally significant infrastructure; to make provision about town and country planning; to make provision about the imposition of a Community Infrastructure Levy; and for connected purposes.
- The Habitats Regulations 2010, which are made under section 2(2) of the European Communities Act 1972, are the principal means by which the Habitats Directive is transposed for England and Wales and territorial seas.
- The Water Framework Directive, the purpose of which is to establish a framework for the protection of inland surface waters, estuaries, coastal waters and groundwater. The framework for delivering the Directive is through River Basin Management Planning. The UK has been split into several River Basin Districts (RBDs).
- The Environment (Wales) Act 2016 puts in place a legislative framework to promote the Sustainable Management of Natural Resources (SMNR).

4) Regulatory Agencies and their roles in Wales

The organisations listed below are those that either regulate aquaculture development, routinely advise regulators, or grant seabed and foreshore title rights. (From: Aquaculture Regulators in Wales)

Local Authorities

- Granting of development consents for land based fish farms. Potential consultee for marine based aquaculture development
- Environmental Health Roles: Disposal of finfish and shellfish mortalities for onshore farming unless a notifiable disease, then Fish Health Inspectorate have overall responsibility
- Competent authority under nature conservation directives

Natural Resources Wales (NRW)

- Licensing of marine activities under the Marine and Coastal Access Act (2009) e.g. finfish and shellfish farms.
- Licence waste and veterinary discharges from fin fish farms & Abstraction and Discharges under Environmental Permitting Regulations (England & Wales) 2010 (as amended).
- NRW are responsible to improve or protect the Shellfish Water Protected Areas to support shellfish life and growth, and to contribute to the high quality of shellfish products suitable for human consumption
- NRW are responsible to improve or protect the Shellfish Water Protected Areas to support shellfish life and growth, and to contribute to the high quality of shellfish products suitable for human consumption
- Competent authority under nature conservation directives

Welsh Government (WG)

- Fisheries management, conservation and enforcement under the Marine and Coastal Access Act 2009, national and European fisheries legislation including the issuing of Several and Regulating Orders under the Sea Fisheries (Shellfish) Act 1967.
- Marine Spatial Planning including identification of aquaculture areas in Welsh seas and links to Welsh Aquaculture Strategy
- Designation of Shellfish Waters under the Water Framework Directive. WG are the appropriate authority for WFD
- Competent authority under nature conservation directives Fish Health Inspectorate (FHI)
- Authorisation of aquaculture production businesses (APBs) under the Aquatic Animal Health (England & Wales) Regulations 2009

- Authorise the import of live fish and shellfish under the Aquatic Animal Health Directive 2006/88, and CITES where applicable
- Permitting under the Alien and Locally Absent Species in Aquaculture (England & Wales) Regulations 2011. Lobster licensing.
- Disposal of shellfish mortality in farmed fish and shellfish where notifiable disease involved
- Assist VMD and APHA with inspections regarding medicated feed and transport of live fish
- Competent/regulatory authority under nature conservation directives where APBs fall within a European protected area (Special Protected Area, Special Area of Conservation or Ramsar Site) * Centre for Environment Fisheries & Aquaculture science (Cefas).
- Advisors to regulating authorities on certain environmental impacts of development proposals.
- Where Cefas/FHI act as a regulatory authority they have a responsibility to carry out such HRA's, unless another regulatory body involved at an earlier stage of any given development has already carried out such an HRA*

Food Standards Agency (FSA)

- Classification and administration of shellfish harvesting areas (shellfish classified waters) and bio-toxin monitoring under Shellfish Hygiene Directive (EC Regulation 854/2004).
- Approval of shellfish purification plants under EC Regulation 853/2004, laying down specific hygiene rules for food of animal origin.
- Competent authority under nature conservation directives

Landowners including The Crown Estate (CE) and Swangrove Estate (SE) and Port Authorities

• Grant seabed/foreshore rights for aquaculture developments

• Competent authority under nature conservation directives

Maritime & Coastguard Agency (MCA)

- Works towards the prevention of the loss of life on the coast and at sea. Production of legislation and guidance on maritime matters, and provide certification to seafarers.
- MCA need to confirm no hazard to navigation for activities exempt from a marine licence.

Trinity House

• Trinity House are required to be contacted after receiving a marine license to determine if navigational markers are required for any aquaculture infrastructure.

Veterinary Medicines Directorate (VMD)

- Protects animal health, human health and the environment. Sampling and monitoring of aquaculture premises.
- Use of Medicated Feed and other medicines in fish farming.

Animal and Plant Health Agency (APHA)

- Notifiable disease regulation and reporting alongside FHI; fish mortalities reporting (via local authorities)
- Animal welfare in transport, on farm and during slaughter. APHA issue licences to all transporters of live animals under the Animal Welfare in Transport Regulations. Those fish farmers (or traders in ornamental animals) who transport their own animals, or specialist companies transporting fish must be licensed.
- Competent authority under nature conservation directives

Gangmasters Licensing Authority (GLA)

Protection of workers from exploitation set up under the Gangmasters (Licensing) Act 2004. The GLA regulates those who provide or employ workers to gather shellfish by hand. It would also cover those who supply workers to carry out processing and packaging of any fish or shellfish and any associated products.

Before setting up a fish, shellfish or crustacean farm (called an aquaculture production business) you must apply to the Fish Health Inspectorate (FHI) for authorisation. This is to prevent the introduction and spread of infectious diseases. From: https://www. gov.uk/guidance/fish-shellfish-or-crustaceanfarm-authorisation

5) Licensing Application Process in Wales

When you apply for authorisation the steps are:

- 1) You apply to the FHI for Authorisation to set up a new aquaculture production business
- You get a confirmation letter with guidance on developing a biosecurity measures plan (BMP). This will also explain if your application must undergo a statutory consultation with other government bodies
- 3) The inspector arranges a site visit
- 4) The inspector reviews your draft BMP and gives advice on record keeping
- 5) The inspector makes a recommendation to an authorisation officer

One of the following then happens:

- You get a licence (if your site is complete and you have a BMP)
- You get a licence in principle (if your BMP hasn't been submitted or your site is still at the planning stage)
- you don't get a licence (if your plans or species don't comply with the law or if it's more appropriate to register your site as a fishery or aquatic animal holding)

Authorisation can take up to 90 days.

If your application is unsuccessful

If your application is turned down FHI will tell you the reasons why and will work with you to resolve problems. They'll also tell you how you can appeal against their decision.

Authorisation conditions

The fish health inspector will outline the conditions of your authorisation. As a condition of your licence you must:

- keep records of all movements in the right format (see the regulations on records, part 2, sections 6 & 7)
- follow good hygiene practice (see your BMP for further details)
- comply with surveillance requirements requested by FHI

• comply with procedures in your approved BMP If you don't comply with authorisation conditions If you don't comply with the conditions of your authorisation your authorisation may be suspended or cancelled. You may also be fined.

Records you must keep

You must keep the following records to show there's a low risk of spreading disease:

- details of movements of any fish, shellfish or crustacean or product into or out of your premises
- number of aquaculture animals that have died in each of your units
- results of your surveillance
- results of surveillance FHI notifies you about

If your details change

If there are changes you must apply to FHI to change your authorisation. You must tell FHI in writing in advance if:

- the owner or operator of the farm changes
- the farm is no longer operational
- the species farmed changes
- the number of tanks, ponds or other holding facilities changes

Authorisation for a purification plant

To set up a shellfish purification plant you need to:

- 1. apply to FHI for Authorisation to set up a new aquaculture production business.
- 2. contact environmental health at your local council to organise an inspection.

Rules for purification centres are set by the Food Standards Agency.

Other Relevant Agencies include:

• Local Authority Planning:

- Natural Resource Wales:
 - o Marine licensing:
 - o Water abstraction and discharge:
 - o HRA & EIA
- Centre for Environment Fisheries & Aquaculture Science (CEFAS)
- Food Standards Agency
- The Crown Estate (CE)
- Maritime & Coastguard Agency (MCA)

6) Best practice in regulation and licensing in Wales

The Welsh Government is committed to delivering 'clean, healthy, safe, productive and biologically diverse oceans and seas'. The Marine and Coastal Access Act 2009 (MCAA) provides the legal mechanism to deliver this vision through a system of management and protection measures for both the marine and coastal environment.

At the present moment regulation concerns include Brexit and the Welsh Government has compiled a consultation report entitled "Brexit and our Seas". The Welsh Government (WG) has committed to retaining, and enhancing where needed, to ensure stability and continuity in key areas as follows:

- WG is committed to the principles and ways of working of Well-being and Future Generations (Wales) Act 2015 (WFG) and this is enshrined in the first Welsh National Marine Plan.
- WG will continue to implement the Environment (Wales) Act 2016, the Marine and Coastal Access Act 2009 and the Nature Directives to improve biodiversity and work toward ecosystem resilience.
- Welsh Government will continue to ensure environmental standards are upheld and enforced, where appropriate, in Welsh waters and the broad framework, as currently set out in the Common Fisheries Policy (CFP), continues for the time being.
- WG is investing in new systems, new staff and new vessels to enforce standards and seek to prosecute those who do not comply.

Shellfish

The Welsh Government recognizes that the process of applying for a Several or Regulating Order to have exclusive access to the seabed for a period of time for aquaculture is currently lengthy. The mechanism for creating Several and Regulating Shellfishery Orders under the Sea Fisheries (Shellfish) Act 1967 could be considered to no longer be the most appropriate management tool. The Welsh Government intends to incorporate an adaptive management system, where both fisheries and aquaculture for shellfish can be flexibly managed so policy changes can be responsive and quick.

7) References:

The Marine and Coastal Access Act 2009

https://www.legislation.gov.uk/ukpga/2009/23/contents

The Planning Act 2008

www.legislation.gov.uk/ukpga/2008/29/pdfs/ukpga_20080029_en.pdf

The Habitats Regulations 2010

http://www.legislation.gov.uk/uksi/2010/490/contents/made

Water Framework Directive

http://www.legislation.gov.uk/uksi/2017/407/contents/made

The Environment (Wales) Act 2016

http://www.legislation.gov.uk/anaw/2016/3/contents/enacted

Welsh National Marine Plan (Draft)

https://gov.wales/sites/default/files/consultations/2018-02/draft-plan-en.pdf

Well-being of Future Generations (Wales) Act 2015

https://futuregenerations.wales/wp-content/.../02/150623-guide-to-the-fg-act-en.pdf

Habitats Regulations Assessment Report

https://gov.wales/draft-welsh-national-marine-plan

Aquaculture Regulators in Wales

https://businesswales.gov.wales/marineandfisheries/sites/marineandfisheries/files/documents/Aqu aculture%20Regulators%20in%20Wales.pdf

Application Process in Wales

https://www.gov.uk/guidance/fish-shellfish-or-crustacean-farm- authorisation

Brexit and our Seas

https://gov.wales/sites/default/files/consultations/2019-05/marine-and-fisheries-policies-for-wales-afterbrexit-consultation-document.pdf

Froehlich HE, Gentry RR, Rust MB, Grimm D, Halpern BS (2017) Public Perceptions of Aquaculture: Evaluating Spatiotemporal Patterns of Sentiment around the World. PLoS ONE 12(1): e0169281. doi:10.1371/journal.pone.0169281

Andalucía Region

Partners: CEEI (LP) / CTAQUA (P4) **Country**: Spain

1) Policy Context for Aquaculture Regulation in Andalucía

In relation to regulatory policies within the framework of the region of Andalucía for the Development of Marine Aquaculture activities, these are regulated by:

- Decree 58/2017 of April 18th
- Law 1/2002 of April 4th

The Decree specifies the corresponding processes to obtain authorizations or permits for the development of aquaculture activities related to:

- Marine Aquaculture Authorization.
- Environmental Authorization.
- Waste Discharge Permit.
- Concession for the Use of Space of Maritime-Terrestrial Public Domain. - Concession for the Use of Space of Public Port Domain.
- Beaconing.

Likewise, spatial planning, control and development of marine fisheries and marine and seafood aquaculture, is regulated by Law 1/2002 of April 4.

The regulation and promotion of marine aquaculture, as an activity integrated in the fishing sector, will have the aim of maximising the use of natural resources and the rational and sustainable development of the activity respecting the environment and increasing its competitiveness.

The main regulatory agencies for these actions are the following:

- Directorate General for Fishery and Aquaculture.
- Directorate General for Prevention and Environmental Quality.
- Directorate General for Coastal and Maritime Sustainability.
- Public Ports Agency of Andalucía.
- National State Ports (Spanish Ministry of Development and the Public Ports Agency of Andalucía).

In relation to the authorization request procedure, it includes the following permits that must be assessed by its competent bodies:

- The Environmental authorization and the waste discharge permit have the General Directorate of Environmental Prevention and Quality as the competent body.
- The concessions for the use of the maritimeterrestrial public domain space have the General Directorate of Coastal and Maritime Sustainability as the competent body.
- The concessions for the use of the domain space of the Public Port have the Public Ports Agency of Andalucía as the competent body.
- The State Ports and the Public Ports Agency of Andalucía are the competent bodies for Beaconing authorizations.

Finally, in the regional framework, Andalucía has a Smart Specialization Strategy, the RIS3. The RIS3 Strategy is a challenge that the European Commission has launched to all regions with the final objective of promoting a new economic model, focused on companies, and based on a firm and determined commitment to innovation, science, technology, internationalization and training.

On the other hand, Andalucía has the Strategy for the Development of Marine Aquaculture 2014-2020. Within the framework of this strategy, lines are established within a sustainable and competitive development of aquaculture, acting on the promotion of innovation and technological development for the progress of aquaculture activities.

With respect to the national regulatory framework, these activities are focused on compliance with the National Multi-Annual Strategic Plan for Aquaculture.

The Spanish Aquaculture Strategic Plan is part of the new Common Fisheries Policy (CFP) and the European Maritime and Fisheries Fund (EMFF) and seeks to respond in strategic guidelines for the sustainable development of aquaculture proposed by the European Commission (Com (2013) 229 final) concerning common priorities and needs for the development of the sector.

2) Analysis of Socio-Economic Impact on Coastal Communities

Research carried out by the Access2Sea Partners in Andalucía showed that a majority of respondents think that aquaculture activities in Andalucía have the potential to provide employment, as the sector is growing and will therefore create direct and indirect staff needs. When considering the different sectors, it was felt that currently the aquaculture sector is not considered by the public administration as a sector that creates stable employment and/or economic wealth. However, by establishing a network and cooperation between research and industry it could become more sustainable in sustaining employment and livelihoods. The academic view in this regard was that there are many influencing factors, like any sector, resulting more from the politics in the respective country than from the sector itself. It can create jobs, but it's not a wide-ranging sector that offers many employment opportunities. The response from public administration seemed to be more focused on the fact that the sector can offer stable employment, but this is dependent on availability of the required expertise.

Among the 36 respondents there was a clear consensus that products from aquaculture can enhance the supply of seafood. In fact, 21 respondents (55,3%), of which 8 were from the general public, 7 from the industry, 3 from public administration and 3 from academia, stated that the extent to which aquaculture activities contribute to enhancing seafood products from the sea is very significant, followed by 13 respondents (34,2%), of which 5 were from the general public, 5 from public administration, 2 from the industry and 1 from academia, consider it significant. Although the explanations ranged, there were clear overlaps between the advantages of consuming products from aquaculture compared to other sources. For example, the most common denominator among the responses are price/quality ratio, continuous availability, environmental benefits, e.g. avoiding overexploitation of wild populations, and standardized quality control from the start,

e.g. avoiding risks of contamination and controlled animal welfare.

Among the 37 respondents, 17 (45,9%) state that the contribution to national tax revenue (national GDP) is minimal, followed by 10 (27%) giving the contribution slightly more importance. However, there was a clear consensus that a growing sector would, of course, create employment and, consequently, contribute not only to national GDP in Spain but also to regional economic growth in Andalucía.

3) Legislation and Regulations in Andalucía

The legislation concerning authorization for the development of marine aquaculture activities in Andalucía is included in the Decree 58 / 2017, of April 18 that regulates marine aquaculture in Andalucía.

This decree was published in the Official Gazette of the Andalucían Regional Executive and its aim is to establish the administrative process for marine aquaculture authorizations, as well as to regulate the registration of marine aquaculture facilities in the Official Register created for this purpose by Law 1 / 2002 of April 4, for the space planning, control and development of Maritime Fisheries and Shellfish and Marine Aquaculture.

The decree specifies the corresponding processes to obtain the following permits as well as competent bodies that regulate them:

- Marine Aquaculture Authorization
- Environmental Authorization
- Waste Discharge Permit
- Concession for the Use of Space of Maritime-Terrestrial Public Domain (if needed)
- Concession for the Use of Space of Public Port Domain. (if needed) Beaconing (if needed)

4) Regulatory Agencies and their roles in Andalucía

1. Directorate General for Fishery and Aquaculture. It belongs to the Andalucían Department of Agriculture, Livestock, Fishery and Sustainable Development. Main competent body for the regulation of the Marine Aquaculture Activities Authorization and for the incorporation of the new activity in the Register of Livestock Holdings (REGA).

2. Directorate General for Prevention and Environmental Quality. It belongs to the Andalucían Department of Agriculture, Livestock, Fishery and Sustainable Development. Competent body for the regulation of the Environmental Authorization and the Waste Discharge Permit.

3. Directorate General for Coastal and Maritime Sustainability. It belongs to the Spanish Ministry for Ecological Transition. Competent body for the regulation of the Concession for the Use of Space of Maritime-Terrestrial Public Domain. (if needed).

4. Public Ports Agency of Andalucía. It belongs to the Andalucían Department of Development, Infrastructures and Spatial Planning. Competent body for the regulation of the Concession for the Use of Space of Public Port Domain. (if needed).

5. National State Ports which belongs to the Spanish Ministry of Development, and the Public Ports Agency of Andalucía which belongs to the Andalucían Department of Development, Infrastructures and Spatial Planning, are both the two competent bodies for the regulation of the Beaconing (if needed).

5) Application Process in Andalucía

GENERAL PROCEDURE FOR MARINE AQUACULTURE ACTIVITIES AUTHORIZATION

1. COMPETENT BODY: Directorate General for Fishery and Aquaculture – ANDALUCÍAN DEPARTMENT OF AGRICULTURE, LIVESTOCK, FISHERY AND SUSTAINABLE DEVELOPMENT.

2. CONTENT OF THE APLICATION: The application form for the Marine Aquaculture Activities Authorization varies depending on the location and type of facility.

2.1. Authorisation for MARITIME- TERRESTRIAL PUBLIC DOMAIN use of space

2.2. Authorisation for PRIVATE DOMAIN use of space

2.3. Authorisation for PUBLIC PORT DOMAIN use of space2.4. Authorisation for EXPERIMENTAL PURPOSES activities.

3. STEP 1: **Public information**: After legislative verification, the project is published in the Official Andalucían Gazette (BOJA). This step is not needed for PRIVATE DOMAIN.

4. STEP 2: **Official information and consultation**: Simultaneously with Public information, reports from different institutions and bodies are compiled.

After STEP 1 and STEP 2, the pertinent **Territorial Delegation** draws up the Technical Report

5. STEP 3: **Culture Authorization**: The **Directorate General for Fishery and Aquaculture** submits a motion for a resolution including the conditions of the culture authorization.

The Procedure for Marine Aquaculture Activities Authorization includes the following authorizations / permits:

- 1. Environmental Authorization
- 2. Waste discharge permit
- 3. Concession for the use of space of Maritime-Terrestrial Public Domain (if needed)
- 4. Concession for the use of space of Public Port Domain (if needed)
- 5. Beaconing (if needed)

1. Environmental Authorization

- I. COMPETENT BODY: Directorate General for Prevention and Environmental Quality -ANDALUCÍAN DEPARTMENT OF AGRICULTURE, LIVESTOCK, FISHERY AND SUSTAINABLE DEVELOPMENT.
- II. CONTENT OF THE APLICATION:
- Descriptive memory
- Project location
- Diagnostic of the territorial and environmental condition
- Other relevant documents if requested

- III. STEP 1: Public information: After verification of environmental legislation compliance, the corresponding **Territorial Delegation** publishes the project dossier in the Official Andalucían Gazette (BOJA).
- IV. STEP 2: Official information and consultation: Simultaneously with Public information, the corresponding Territorial Delegation submits the project and the environmental study to the local councils affected.
- V. STEP 3: Authorization: Issue of the environmental authorization report
- 2. WASTE DISCHARGE PERMIT
- I. COMPETENT BODY: Directorate General for Prevention and Environmental Quality – ANDALUCÍAN DEPARTMENT OF AGRICULTURE, LIVESTOCK, FISHERY AND SUSTAINABLE DEVELOPMENT.
- II. CONTENT OF THE APPLICATION: Application form for discharge permit in MARITIME-TERRESTRIAL PUBLIC DOMAIN and PUBLIC WATER DOMAIN.

III. STEP 1: Application:

- Waste discharge statement.
- If construction permit is needed, a preliminary report should be requested to the Territorial Delegation of Agriculture, Livestock, Fishery and Sustainable Development.
- Report request to the component unit of hydrological planning
- IV. STEP 2: Public information: After verification of environmental legislation compliance, the corresponding Territorial Delegation publishes the project dossier in the Official Andalucían Gazette (BOJA).
- V. STEP 3: Official information and consultation: Simultaneously with Public information, reports from different institutions and bodies are compiled.

VI. STEP 4: Authorization: After STEP 2 and STEP 3, the Andalucían department of Agriculture, Livestock, Fishery and Sustainable Development draws up a report including the waste discharge conditions.

3. CONCESSION FOR THE USE OF SPACE OF MARITIME-TERRESTRIAL PUBLIC DOMAIN

- COMPETENT BODY: Directorate General for Coastal and Maritime Sustainability – SPANISH MINISTRY FOR ECOLOGICAL TRANSITION.
- II. CONTENT OF THE APPLICATION: Included in the Marine Aquaculture Activities Authorization.
- III. STEP 1: Application: The promoter delivers the application form for the authorization of Marine Aquaculture Activities to the Directorate General for Coastal and Maritime Sustainability, who in turn issues the project to the Peripheral Coast Service (SPC).

IV. STEP 2: **Preliminary report / SPC**: The SPC evaluates the documentation and draws up a preliminary report which is submitted to the Directorate General for Coastal and Maritime Sustainability.

V. STEP 3: Mandatory report / Directorate General for Coastal and Maritime Sustainability: The Directorate General for Coastal and Maritime Sustainability draws up the mandatory and binding report about the viability of the concession and conditions of use of space.

VI. STEP 4: **Concession**: The Directorate General for Coasts informs the promoter about the conditions of the use of space concession. Subsequently, if the promoter accepts the conditions, the Directorate General for Fishery and Aquaculture submits the concession of the use of space.

4. CONCESSION FOR THE USE OF SPACE OF PUBLIC PORT DOMAIN

I. COMPETENT BODY: Public Ports Agency of Andalucía - ANDALUCÍAN DEPARTMENT OF

- II. CONTENT OF THE APPLICATION: The application will include:
- Holder/Entityidentification
- Accreditation of economic and technical solvency
- Basic project adapted to spatial planning of the port service area
- Economic and financial memory of the project
- Compliance with the specific conditions
- Provisional guarantee
- Another relevant documents if requested
- III. STEP 1: Public information: Publication in the Official Andalucían Gazette (BOJA).
- IV. STEP 2: Official information and consultation: Simultaneously with Public information:
- If the spatial planning of the port service area is not yet approved, a report from the planning authorities will be requested.
- If the application aims to use the Public Domain pertaining to the Lighthouses Service, it needs the approval from State Ports – SPANISH MINISTRY OF DEVELOPMENT.

V. STEP 3: **Concession**: The corresponding Territorial Delegation receives the final resolution and informs the promoter.

5. BEACONING

I. COMPETENT BODY: **State Ports** – SPANISH MINISTRY OF DEVELOPMENT. Public Ports Agency of Andalucía – ANDALUCÍAN DEPARTMENT OF DEVELOPMENT, INFRASTRUCTURES AND SPATIAL PLANNING.

- II. CONTENT OF THE APPLICATION: The promoter delivers along with the aquaculture project, the following documentation:
- Current situation and existing signs.
- Brief justification.
- Location map including potential shipping obstructions, bathymetry, northern march and graph scale.

- III. STEP 1: Application for provisional beaconing: The Territorial Delegation makes the beaconing request to State Ports for the distribution of beacons and type of signs requested.
- IV. STEP 2: Provisional beaconing: The provisional beaconing authorization is reported to the Territorial Delegation, who in turn informs the promoter.
- V. STEP 3: Definitive beaconing: State Ports evaluates the definitive beaconing prosecution history in the Lighthouses Commission.

OTHER PERMITS AND REGISTRATIONS 1. REGISTER OF LIVESTOCK HOLDINGS (REGA)

- I. COMPETENT BODY: Directorate General for Agriculture and Livestock Production – ANDALUCÍAN DEPARTMENT OF AGRICULTURE, LIVESTOCK, FISHERY AND SUSTAINABLE DEVELOPMENT.
- II. CONTENT OF THE APPLICATION: REGA registration form

2. DATA BASE FOR IDENTIFICATION AND REGISTRATION

- COMPETENT BODY: Directorate General for Fishery and Aquaculture – ANDALUCÍAN DEPARTMENT OF AGRICULTURE, LIVESTOCK, FISHERY AND SUSTAINABLE DEVELOPMENT.
- II. CONTENT OF THE APPLICATION: To be made ex officio

Licence Periods, Terms and Conditions in Andalucía

Marine Aquaculture Authorisation. First evaluation of the project, consultation and public information

- Administrative resolution: It depends on the type of space requested in the application:
 - a. Private estates: 3 months
 - b. Maritime-Terrestrial Public Domain or
 - Public Port Domain: 6 months
- Competent body: Directorate General for Fishery and Aquaculture

Environmental authorization, waste discharge and water collection (this license is processed in parallel with the Marine Aquaculture Authorisation)

- Administrative resolution to obtain the Unified Environmental Authorization (AAU): 4 months (extendable to 6 months)
- Competent body: Directorate General for Prevention and Environmental Quality

Concession for the use of space of Maritime-Terrestrial Public Domain / Public Port Domain (either of two must be submitted after the resolution of the AAU).

• Administrative resolution:

a. Maritime-Terrestrial Public Domain: 6 –
8 months (it might be extended in some projects)
b. Public Port Domain: Up to 8 months

• Competent body:

a. Maritime-Terrestrial Public Domain: Directorate General for Coastal and Maritime Sustainability b. Public Port Domain: Public Ports Agency of Andalucía

Beaconing authorization (it must be submitted after the resolution of the AAU)

- Administrative resolution:
 - a. Provisional authorization: 1-2 months
 - b. Definitive authorization: 3-4 months
- Competent body: National State Ports and Public Ports Agency of Andalucía

Register of Livestock Holdings (REGA) (it is included in the Marine Aquaculture Authorisation)

7) References

Official Gazette of the Andalucían Regional Executive (BOJA) https://www.juntadeandalucia.es/boja/2017/76/6

National Advisory Board for Marine Aquaculture (JACUMAR)

https://www.mapa.gob.es/es/pesca/temas/acuicultura/and_mar_abr_19_tcm30-510436.pdf

The Aquaculture Committee of Andalucía

https://www.juntadeandalucia.es/organismos/agriculturaganaderiapescaydesarrollosostenible/areas/ pesca-acuicultura/acuicultura/paginas/comite-acuicultura-andalucia.html

Administrative resolution: N/A

Competent body: Directorate General for Fishery and Aquaculture

6) Best practice in regulation and licensing in Andalucía

The Aquaculture Committee of Andalucía, which reports to the Andalucían Department of Agriculture, Livestock, Fishery and Sustainable Development, created in 2017 different working groups for the analysis and follow up of relevant aspects related to the development of aquaculture activities in Andalucía.

These Working Groups include different agents involved in aquaculture activities such as representatives of the regional administration, stakeholders or those selected as permanent members of the committee.

The main objective of these Working Groups is to serve as a tool for channelling the needs and tackling relevant constraints and difficulties in relation to the development of aquaculture activities. Working groups are divided in five different topics being Group 4 specific for the Use of concessions and authorizations.

These Working Group have a face-to-face annual session where the issues of interest related to the use of concessions and authorizations for aquaculture activities are discussed and solutions and corrective measures are proposed for their future implementation. Also, the follow up of previous measures is carried out and amended if necessary.

Irish Region

Partners: WestBIC & Údarás na Gaeltachta **Country**: Ireland

1) Policy Context for Aquaculture Regulation in Ireland

The policy context for the Aquaculture Sector in Ireland is outlined in the following publications:

"Harnessing our Ocean Wealth – An Integrated Marine Plan for Ireland" (July 2012). This report set out a roadmap for the Government's vision, highlevel goals and integrated actions across policy, governance and business. Implementation of this Plan included an integrated system of policy and programme planning for Irish marine affairs. www. ouroceanwealth.ie

 "Review of the Aquaculture Licensing Process" Independent Aquaculture Licensing Review Group (2017)

http://www.fishingnet.ie/media/fishingnet/ content/ReviewoftheAquacultureLicensing Process310517.pdf

- "Food Wise 2025" (July 2015). This report set out a ten year plan for the agri-food sector and illustrated the potential for this sector to grow even further. The report noted trends such as:
- o Projections that world consumption of fish will grow by an average annual consumption of 17 kg per person per annum resulting in a requirement for an extra 40 million tonnes of seafood by 2030=
- o The projected shifting global economic gravity towards the east where there is a strong cultural preference for seafood
- o The growing health and wellness trends with seafood being a versatile, convenient and protein source with specific and recognised health properties which resonate with the modern consumer.

2) Analysis of Socio-Economic Impact on Coastal Communities in Ireland

Aquaculture activities are very important to sustain the employment and livelihoods of the people in Ireland. A reliance on the aquaculture industry in remote coastal areas of the northwest and southwest of Ireland, where economy faces greater challenges in a national context due to its geographic isolation. The economic significance of the aquaculture industry in these peripheral areas is indisputable. All jobs created in these regions will have a knock-on effect on improved livelihoods for the people as they have a regular income.

There has been a steady reduction in the number of businesses operating in some sectors of Irish aquaculture from 2009 to 2018. This consolidation process has been fueled by foreign direct investment by a large multinational in the case of salmon farming and in the case of bottom grown mussels and oyster farming via investments from Dutch and French shellfish farmers. There is a move away from seasonal employment in the shellfish sector, with an increase in automation due to associated rising costs.

Employment over the 2009 to 2018 period, has fluctuated between 1,700 and 1,900. In 2018, 1,948 persons, equating to 1,077 Full Time Equivalents (FTEs) were directly employed.

In 2018 employment increased slightly by 1%, when compared to 2017, despite it being a challenging year. Overall employment in 2018 was highest in the North (25%), followed by the Southeast (18%) and the West (15%). Employment is set to remain stable for 2019 and beyond given present production trends and steady market demand.

Employment in 2009 was over 1,900 persons and after some fluctuations has returned to this level in 2018, having dropped to lows between 1,700 and 1,800 persons in 2012. Full-time equivalent employment (FTE) meanwhile varied from just over 900 to 1,050 in the same period. Native oyster employment may have been over-estimated due to lack of data obtained.

Female employment level, over this time, has remained relatively static, ranging from 120 to 150 or from 6.4% to 8.2 % of total employed. The shellfish sector was the biggest employer over the period and included the greatest proportion of parttime or seasonal work. The Finfish sector by contrast, provided mainly full-time employment and the best average wage, in excess of $\leq 40,000$ annually.

3) Legislation and Regulations in Ireland

The Fisheries Amendment Act (1997) sets out the legislation for regulation and licensing of aquaculture in Ireland. This Act has been amended on a number of occasions. The main regulation is the Aquaculture (Licence Application) Regulations 1998 which has also been amended on a number of occasions. Aquaculture is also guided by a number of EU Directives and Statutory Instruments including: the EU Directives on Environmental Impact Assessment (EIA) and the Protection of Birds and Natural Habitats.

Licences in the marine environment generally involve part of the State owned foreshore (defined as the seabed and shore from the high water mark out to the limit of the territorial seas). Any activity on the foreshore requires consent and these applications are processed in parallel with aquaculture licence applications.

4) Regulatory Agencies and their roles in Ireland– Licensing Authority:

The Licensing Authority in Ireland is the Minister for Agriculture, Food and the Marine. The Aquaculture of Foreshore Management Division of the Department for Agriculture, Food and the Marine manages the processing of aquaculture licences on behalf of the Minister.

Support Agencies involved:

- The Marine Engineering Division of the Department of Agriculture, Food and the Marine undertakes site mapping duties.
- The Marine Institute, An Bord Iascaigh Mhara, and The Sea Fisheries Protection Authorities (State Agencies) provide scientific advice on environmental and aquaculture matters.
- Where necessary Local Authorities and / or Harbour Authorities may also be consulted.

5) Licensing Application Process in Ireland Licenses in Ireland fall into three main categories as follows:

- Marine Finfish
- Shellfish
- Land-based

Licences are typically issued for 10 years but the 1997 Act provides for licence duration of up to 20 years.

6) Best practice in regulation and licensing in Ireland

There is an opinion amongst Stakeholders that there is currently no best practice in place in regulation and licensing in Ireland. A review of regulation and licensing is underway by the Irish Government and includes:

- Report of the Independent Aquaculture Licensing Review Group - 2017
- Marine Planning Policy Statement 2019
- Review of Co-ordinated Local Aquaculture Management Systems (C.L.A.M.S.) *

The backlog of license applications in shellfish, while addressed in terms of applications is still unsatisfactory to the industry as it does not allow any degree of best practice. This is even more so the case with the finfish industry. It is hoped that with the CLAMS review and with the inclusion of a stated goal in the Programme for Government 2020, that the Review of Aquaculture 2017 would be implemented along with the Housing Dept's nascent marine plan, and that these developments will begin to show best practice results soon.

* The Co-ordinated Local Aquaculture Management Systems (C.L.A.M.S.) process is a nationwide initiative to manage the development of aquaculture in bays and inshore waters throughout Ireland at a local level. In each case, the plan fully integrates aquaculture interests with relevant national policies. While it is not a licensing or regulatory process, C.L.A.M.S provides a policy backdrop which helps in the formation of a detailed evaluation of individual licence conditions. C.L.A.M.S. can inform those tasked with compliance monitoring regarding general issues such as bay carrying capacity.

7) References

"Harnessing our Ocean Wealth – An Integrated Marine Plan for Ireland" (July 2012). www.ouroceanwealth.ie

"Review of the Aquaculture Licensing Process" Independent Aquaculture Licensing Review Group (2017) http://www.fishingnet.ie/media/fishingnet/content/ReviewoftheAquacultureLicensingProce ss310517.pdf

"Food Wise 2025" (July 2015). https://www.agriculture.gov.ie/foodwise2025/

Report of the Independent Aquaculture Licensing Review Group – 2017 http://www.fishingnet.ie/media/fishingnet/content/ReviewoftheAquacultureLicensingProce ss310517.pdf

Marine Planning Policy Statement – 2019 https://www.housing.gov.ie/sites/default/files/publications/files/marine_planning_policy_st atement.pdf

The Co-ordinated Local Aquaculture Management Systems (C.L.A.M.S.) http://www.bim.ie/media/bim/content/BIM_CLAMS_Explanatory_Handbook.pdf

Portuguese Region

Partner: University of Algarve – UAlg **Country**: Portugal

1) Policy Context for Aquaculture Regulation in Portugal

The European Commission formally approved the MAR 2020 Operational Program by Implementing Decision of 30.11.2015 approving the Operational Program "European Maritime and Fisheries Fund - Operational Program of Portugal" to support the European Maritime and Fisheries Fund in Portugal. MAR 2020 aims to implement in Portugal the support measures under the European Maritime and Fisheries Fund (EMFF) and its Strategic Priorities:

- Promote competitiveness based on innovation and knowledge.
- Ensure the social and environmental economic sustainability of the fisheries and aquaculture sector, contribute to the good environmental status of the marine environment and promote the Integrated Maritime Policy.
- Contribute to the development of coastal zones, increase employment and territorial cohesion as well as increase the capacity and skills of professionals in the sector.

The new Operational Program includes new priority areas of intervention, which were previously

managed directly by the European Commission, such as the Data Collection Program, Fisheries Control and Surveillance, the Common Organization of Fishery Markets and Aquaculture, the Compensation Plan for the Outermost Regions and, under shared management, the Integrated Maritime Policy.

The mission structure for MAR 2020, in addition to its capabilities under the European Maritime and Fisheries Fund, will ensure proper monitoring of the Program, ensuring control and monitoring of operations, preventing and detecting irregularities, promoting reduction intervention deadlines, response and giving greater reliability to the results obtained.

MAR 2020 PRIORITY 2 - PROMOTING ENVIRONMENTALLY SUSTAINABLE, RESOURCE-EFFICIENT, INNOVATIVE, COMPETITIVE AND KNOWLEDGE-BASED AQUACULTURE

- Measure 1 Sustainable development of aquaculture
- Measure 2 Development of aquaculture sites
- **Measure 3** Organic aquaculture and environmental services
- Measure 4 Public Health Measures
- **Measure 5** Promotion of animal health and welfare
- **Measure 6** Insurance for aquaculture stocks
- **Measure 7** Promotion of human capital and networking

Portugal has a long-standing tradition and history in fisheries. Despite its limited contribution to the gross domestic product (GDP), the Portuguese fisheries' sector represents a primary sector of significant socio-economic importance, particularly in coastal areas. Aquaculture in Portugal does not represent more than 6% of the catches; however, it is growing rapidly and could become an important activity for the fisheries sector. At the same time, it offers other socioeconomic benefits like employment opportunities and contributes to local coastal economies.

In 2013, the aquaculture sector produced 10 300 tonnes, corresponding to EUR 53.7 million. In the same year, Portuguese aquaculture comprised 1 443 farms employing 2 572 workers, or 2 083 FTEs (full time equivalents).

Portugal is by far the main fish consumer inside the EU 27 with 56.9 kg per capita/year, while the EU average is 21.4 kg/head/year. However, Portuguese consumers are skeptical about aquaculture. This might be related with unconstructive messages, commonly spread among consumers, which result in the preconceived idea that seafood from aquaculture is generally of a worse quality compared to wild fisheries. Vast improvements in the public image of the aquaculture sector need to be undertaken. Stakeholders have the huge challenge of clarifying consumers about the positive aspects of aquaculture products and in the demystification of several erroneous ideas.

Employment in the aquaculture industry in Portugal for 2011, represented 2.316 direct jobs where 18% where women, and with only 5 companies employing more than 10 people. Most of the workers have low qualifications and working within a family business, but there are also a significant number of people with higher education (university level). The national production of aquaculture for 2012 only contributed 5.4 % (10.317t) to the total seafood landings, and therefore cannot yet be considered an alternative to the traditional fisheries sector.

The Portuguese aquaculture industry produces marine finfish species and shellfish. The former far

exceeds the latter in size — marine fish production accounted for more than 57 % of the total sales value in 2013. The main cultured marine species are sea bream, sea bass and turbot. In 2013, Portuguese aquaculture production totalled 10 300 tonnes and EUR 58.8 million in value.

It is estimated that the blue economy represents 3% of the Portuguese GDP.

The total production of aquaculture in the Algarve region in 2013 represented a total of 4.403t with an estimated value of 27M euros, which represented an increase compared with 2012, with a production of 3.509t and a value of 24,1M euros. The bivalve aquaculture is still the most important aquaculture type in the Algarve; fish produced in ponds represent only 9, 2%. Most of the bivalve aquaculture sites are located within the Ria Formosa lagoon, where the extensive aquaculture contributes to 88% of the total production. The good clam (Ruditapes decussatus) is the main species being produced, but mussel production doubled from 2012 to 2013 with a total 1 547t, mostly due to the recent offshore installations.

3) Legislation and Regulations in Portugal

- Ordinance No. 280/2017, of 19 September, establishes the form of calculation, the amount, the exemptions, the form of division and delivery of the Aquatic Fee (TAQ) collection product.
- Ordinance No. 279/2017, of 19 September, sets out the instructional elements that must be presented by the interested party in the procedures provided for in Article 8 (2), Article 9 (2), Article 12 (1) and Article 13 (2) of Decree-Law 40/2017 of 4 April, which defines the legal framework for the establishment and operation of crop establishments in marine waters, including transitional waters, and in inland waters.
- Ordinance No. 276/2017, of 18 September, establishes the regime and the amount of the guarantee to ensure, at the time of termination of the Aquaculture Activity Title (TAA), the good environmental status of the marine environment and water bodies. and removal of works and movable structures within the area or volume.

- Decree-Law No. 40/2017, of 4 April, approves the legal regime for the establishment and operation of marine culture establishments, including transitional waters, and inland waters, under the use of the legislative authorization granted by Law No. 37/2016 of December 15. This Decree-Law applies to marine and inland waters cultivation establishments and related establishments located on private property, State private domain, State public domain and local authorities, including the public domain. water. The provisions of this Decree-Law shall not apply to State aquaculture posts, aquaculture units or holding captive aquaculture species for selfconsumption, ornamental, didactic, technical or scientific purposes only.
- Decree-Law No. 152/2009 of 2 June Transposes Council Directive 2006/88 / EC of 24 October on zoosanitary requirements for aquaculture animals and derived products.
- Regulatory Decree No. 9/2008 of 18 March Defines the fundamental rules for the establishment of offshore aquaculture production areas (APA).

4) Regulatory Agencies and their roles in Portugal

The establishment of an aquaculture farm implies obtaining two licenses, one for the use of water resources (bank, bed and water) and another for the exercise of the activity.

The entities responsible for licensing the use of water resources are the Portuguese Environment Agency I.P. (APA), the Port Administrations and Docapesca, S.A., in the areas under their jurisdiction. The licensing of the activity is the responsibility of the Directorate-General for Natural Resources, Safety and Maritime Services (DGRM) for marine and brackish waters and the Institute for Nature Conservation and Forests (ICNF) for inland waters, without prejudice to any necessary previous studies or opinions.

In the Autonomous Regions (Madeira and Azores), licensing entities are services of the Regional Environment and Fisheries Administration under the respective Regional Government.

5) Licensing Application Process in Portugal

The installation process of an aquaculture establishment begins with the application for the allocation of the water use right which must, among other things, indicate:

- The area of water domain (public or private) to occupy;
- Estimated volumes of water to be used;
- The conditions and characteristics of rejections;
- Details of the specific location of the biogenetic crop establishment to be installed.

The application is publicized and, if other interested parties arise, a tender procedure will be initiated for the use of public water domain areas.

After the development of the tender procedure or in its absence, the licensing of the use of water resources is made by the Portuguese Environment Agency I.P. (APA I.P.), the Port Administrations and Docapesca, I.P., administrators of the marine public domain.

For open sea aquaculture production areas (APA) set up by Regulatory Decree No 9/2008, a single title shall be issued for the use of and the establishment of establishments, which is already an advance in the simplification of licensing.

This scheme defines the conditions for the establishment of open sea farm establishments in predefined areas, delimiting the use of common resources, security constraints and monitoring of environmental parameters. The allocation of the lots constituting these aquaculture production areas is made by public tender.

The authorizations for the use of water resources issued up to 2007 had an average validity period of 10 years. From 2007, it was possible to grant a private use title for the establishment of aquaculture establishments in marine waters through the conclusion of a concession contract of maximum 75 years. This deadline is set taking into account the nature and scale of the associated investments, as well as their economic and environmental relevance. The installation authorization process may last from 4 to 6 months and is granted after an inspection involving all the competent authorities:

- DGRM;
- ICNF for coastal water domain areas that are classified as protected areas;
- BB I.P. or another of the administrators of the maritime public domain;
- Portuguese Institute of Sea and Atmosphere (IPMA);
- Town hall;
- Captain of Porto (if the establishment is located in an area under its jurisdiction);
- General Directorate of Health (DGS);
- General Directorate of Food and Veterinary (DGAV).

The exploration license, which has the same duration as the license for private use of public domain areas or renewable for 15 years, in the case of establishments located on private land, is granted by DGRM after a survey of the establishment, in which It is accompanied by IPMA and DGAV and ICNF in the areas under its jurisdiction.

6) Best practice in regulation and licensing in Portugal

Given the administrative complexity and the number of entities involved, it is intended to reduce and simplify the administrative procedures for obtaining the necessary licenses for the establishment of aquaculture establishments and, therefore, to ensure a timely decision for the investor, reducing the degree of investment uncertainty.

The simplification of the administrative processes, combined with the planning and zoning of places destined for the activity, are indispensable conditions to speed up the whole process, eliminating some of the constraints to the development of this productive sector.

To achieve this goal, it is essential to create the necessary conditions for licensing processes to become more agile. These conditions entail wellinformed procedures by developers and the reduction and simplification of the various existing procedures, so that the whole process of setting

up an aquaculture establishment is efficient, giving entrepreneurs a quick response to market stimuli.

7) References

Plano Estratégico para a Aquicultura Portuguesa 2014 – 2020. Direção Geral de Recursos Naturais, Segurança e Serviços Marítimos (DGRM). Ministério da Agricultura e do Mar.

Brittany Region Partners: Technopole Quimper Cornouaille / Investir en Finistère Country: France

1) Policy Context for Aquaculture **Regulation in Brittany**

French aquaculture is not regulated in a single text, aquaculture is divided in 2 different categories which are inland and marine aquaculture. Moreover, shellfish culture distinguished itself from other cultures due to its importance in the sector (it represents about 80% of the French aquaculture production). Inland aquaculture is regulated by the code de l'environnement, while marine aquaculture is regulated by the rural and marine fisheries code (Code Rural et de la Pêche Maritime) and the Decree n°83-228 of the 22nd of march 1983 establishing the licensing regime for marine farming.

The ministry of Agriculture, Fisheries and Rurality is responsible for this sector at the state level. Other relevant organisations with which this ministry can collaborate in the governance of aquaculture is the Department of Maritime Affairs and People of the Sea of the Ministry of Infrastructure, Transport, Land Use, Tourism and the Sea.

Concerning marine aquaculture concessions, the decree stipulates the nationality requirements and professional qualifications required of applicants. It also details whether they are natural persons, legal persons or public bodies. Applications for authorization must be addressed to the Departmental or Interdepartmental Director of Maritime Affairs (DDTM in Finistère). Depending on the cost, scope or location of the project, the procedure may include a public inquiry, as stipulated in the appendix to

Decree No. 85-453 implementing Law No. 83-630 on the democratization of public inquiries and the protection of the environment. The opinion of several authorities is required such as the taxing authority, the local health service, the French Research Institute for the Exploitation of the Sea (IFREMER), the municipal authorities concerned and the competent professional organizations and the Commission of the marine culture. The final decision belongs to the local committee of marine cultures which has administrative and regulatory powers. The concession is then granted by the prefect, the commissioner of the republic of the competent department, and notified to the applicant.

2) Analysis of Socio-Economic Impact on Coastal Communities in Brittany

There is a strong support from regional and local authorities to increase the number of jobs in aquaculture in Brittany. The European funds from the European Maritime and Fisheries Fund is a key tool in this respect. The creation of jobs in aquaculture is viewed as a mean to boost the regional economy and to create other activities such as maintenance or navigation.

However, the sector is not structural for the local economy yet as it is not able to employ employees during the whole year according to representatives of the CRC Bretagne Nord. The aquaculture sector in Brittany is dominated by shellfish culture and the latter employs workers during the high season, which is in winter. During the other months, the aquaculture sector is not employing enough persons to be considered as being structural for the region. Thus, this argument can be contested by local population and is hardly useable to raise the acceptability level.

Academic researchers explained that overall, compared to other regions in France, aquaculture is having an important role in the economy of Brittany.

According to administrative managers of the Brittany region, the importance of the aquaculture sector is not recognised as being significant by local citizens, despite aquaculture's strong contribution to the maritime economy in Brittany. Most of citizens do not have enough knowledge on maritime issues to consider aquaculture as being an important sector for employment in Brittany. One of the solutions to increase the contribution of aquaculture on regional employment would be to increase the exploited surfaces.

In order to increase the number of employments in the aquaculture sector, new farms must be created on possible sites.

Finally, the SUCCESS's survey on consumer preferences demonstrates that over 69% of French interviewees agree to say that the development of fish farms is creating jobs. This latter survey shows that aquaculture can be seen as having a significant role for creating jobs and boosting the national economy.

3) Legislation and Regulations in Brittany

At the departmental level, the document called « Schéma des Structures des Exploitations de Cultures Marines » (SSECM)is the local global document for the planification of marine cultures in Finistère. This document must respect all the legal and regulation frameworks mentioned in the section above. This document is subject to an environmental evaluation that includes the evaluation for Natura 2000 areas. SSECM does not cover new species, technical aspects and construction. However, diversifications and experimentations are possible under certain conditions. Moreover, the project must respect other regulations defined by the environmental code and the General Code of ownership of public persons (CG3P, regarding the occupation of the public domain).

Finally, different other regulations must be respected such as:

- Health regulation "paquet hygiene", classification of areas and contaminants
- Animal health regulations
- Land regulations
- Any other regulation must be taken into account such as labour law and business laws
- Regarding buildings or ponds... specific regulations (depending on the project) and the managing authority if public domain.
4) Regulatory Agencies and their roles in Brittany

At the departmental level, The Direction Départementale des Territoires et de la Mer (DDTM) is the regulatory agency for installing new aquaculture plants. Its role is to promote sustainable development in the Finistere Department and to implement orientations regarding agriculture, urban, housing and construction plans. It is also implementing policies concerning maritime investments. Furthermore, it is in charge of protecting the environment such as specific animal species. When a stakeholder wishes to invest in a new aquaculture site, it must submit its request at this authority.

In addition, local councils must be consulted for questions related to urbanism.

5) Licensing Application Process in Brittany

Figure 5.1 below outlines the steps required to apply for an aquaculture licence in Brittany.

The licence can last up to 35 years. It is necessary to comply with the different legislations and regulations mentioned above to obtain a licence for an aquaculture plant.

Individuals who get a concession have maintenance obligations described in the article 6 of the Schéma

des structures. In case the maintenance is not done properly, the concession can be suspended or even withdrawn. If a concession is not exploited during more than 3 years, the concession will be considered as being unexploited. If a concession is considered as being unexploited several times, this one will be suspended or withdrawn. However, if some concessions are unexploited due to epizootic reasons, the concessions will not be suspended.

The level of fish density must respect conditions written in the annexe 3 of the Schéma des Structures. Finally, individuals having a concession must respect the initial terms and conditions of the specifications.

6) Best practice in regulation and licensing in Brittany

In 2010, the French government took the decision to facilitate the regulatory access to aquaculture investments through the creation of the schémas régionaux de développement de l'aquaculture marine (SRDAM). This document aims at giving key information to aquaculture project leaders on the regional space availabilities for new farms, facilitating the licensing process. However, The SRDAM does not exist in Brittany yet.

In Finistère a prefectural decree named "Shéma des structures des exploitations de cultures marines du département du Finistère" aims at facilitating



Decision/Notification/Signature of the specifications

Concession of marine culture (35 years maximum, paid by a royalty): authorisation of occupation of the public domain with specifications. If not respected => withdrawal of the concession

the establishment of new aquaculture farmers. For instance, it promotes the establishment of young farmers, secure the maintenance of economically viable enterprises by avoiding their breaking up and promoting their recovery, it allows the creation or the resumption of operations with a functional unit, enables the expansion of holdings that do not reach the minimum reference dimension, promotes the redevelopment of marine farming areas and the establishment of young farmers, particularly by setting some areas granted to regional shellfish farming committees. The scheme has been subject to an environmental assessment and a joint impact assessment. Measures to avoid, reduce or offset the impacts of marine crops have been reduced.

A second good practice is the SAFER* convention on shellfish farming. Each year, 7 to 15 transmissionsinstallations of aquaculture farms end up in Brittany, but for each operator who ceases his activity, the risk of losing this land for the profession is very present. Indeed, to operate, a shellfish farming concession must have a space on land with direct access to the sea. It thus occupies, at the same time, a part of the private terrestrial domain and the maritime public domain. This land is highly coveted: the maritime part, by professionals who want to extend their activities (fishermen other aquaculture farms...), and the private land part, by private individuals and the residential pressure existing on the coast. In addition to this, financing plans are sometimes long to complete.

*SAFER: Société d'Aménagement Foncier et d'Etablissement Rural (Land settlement organization): The organization that manage the land sales in the rural areas.

This is why in April 2018, the Region Brittany signed a partnership with the SAFER (the organisation that manage land sales in rural areas) and the two regional shellfish farming committees through which it undertook to mobilize up to €200,000 by the end of 2019 to, support the costs of land monitoring and financial storage costs (loan rate), pay compensatory indemnities in the case of a retrocession price lower than the cost price? While the convention will be updated next year, it has already allowed to intervene on two projects in south Brittany.

7) References

FAO (2019), Vue générale de la législation nationale sur l'aquaculture, France, from:

http://www.fao.org/fishery/legalframework/nalo_ france/fr

Direction Départementale des territoires et de la mer (DDTM),

http://www.finistere.gouv.fr/Services-de-l-Etat/ Agriculture-environnement-amenagement-etlogement/Direction-departementale-des-territoireset-de-la-mer-DDTM/La-DDTM

Schéma des Structures

http://www.finistere.gouv.fr/content/ download/20883/166373/file/1%20-%20 arr%C3%AAte%202015334-002.pdf

https://www.europe.bzh/jcms/prod_463858/fr/ foncier-feamp-et-prospective-loig-chesnais- girardechange-avec-les-professionnels

4.3 Profile of Aquaculture Business Models

A business model describes the rationale of how an organisation creates, delivers, and captures value in economic, social, and cultural contexts. It is a plan for the successful operation of a business and includes identifying sources of revenue, the intended customer base, products and details of financing.

Traditionally Business Models fell into four categories:

- Business to Consumer
- Business to Business
- Consumer to Business
- Consumer to Consumer

With the evolution of technology there are now over 100 types of business models and a there are almost as many models are there are businesses. Irrespective of the model there is a consensus that all business models address the key ingredients of a business model canvass.

Any business model should clearly address the following areas:

- a) Key Partners
- b) Key Activities
- c) Value Proposition
- d) Customer relationship
- e) Customer Segment

A report titled "Pro poor Business Models for Aquaculture" published by Worldfish states that "smallholder farming dominates worldwide aquaculture production with 90% of production from developing countries and approximately 20 million smallholder farmers engaged in production". This profile of the productive sector is similar to the production activity among the Access2Sea partner regions. Research carried out by the partnership show that in the partner regions there are a total of 621 participants, the vast majority of which are categorised as micro or SMEs businesses.

While small scale aquaculture can be economically feasible these businesses face constraints in accessing

finance, information, management capacity and technological capability. In addition, smallholders suffer disproportionally from external barriers such as market imperfections and regulations. Reviews in Aquaculture published by John Wiley and Sons Ltd specify barriers to aquaculture business as follows:

- a) Access to inputs, technical assistance, and services. Smallholders lack access to affordable and high-quality inputs such as feed and seed, technical knowledge, affordable transport, and storage facilities
- b) Access to finance. Smallholders lack access to capital and credit as bankers perceive aquaculture as a higher risk venture. This means a lack of financial products to facilitate the sector
- c) Poor Infrastructure and inefficient institutions. Where these are lacking there are limits to growth
- d) Challenges in coordination e.g., high transaction costs between smallholders and others in the value chain
- e) Inability to meet standards and regulation
- f) Excessive individual risk related to commercialisation

The research carried out under Access2Sea identified a multiplicity of business models that are applicable to the aquaculture sector. All have their advantages and constraints, and none are uniquely applicable to the aquaculture sector exclusively.

Evolution of Business Models in Aquaculture:

Like other businesses aquaculture has had to respond to multiple and changing conditions. The evolution has involved various forms of horizontal and vertical cooperation. Horizontal involves businesses engaging in some form of organisation/cooperation amongst themselves.

Vertical cooperation leads to a greater involvement higher up the value chain. A more formalised/ structured corporate model emerges as the business becomes engaged in more vertical integration. The Worldfish study examined three models with the following observations:

Horizontal:

Advantages include an aggregation of needs, like input supply, better access to markets, influence and possibilities for collective management of common resources. Constraints relate to the required management capacity.

Vertical:

Focuses more on inclusion of farmers and other partners within the respective value chains with the advantage of a greater degree of market interaction and potential for improved prices and/or more secure markets. Constraints include the focus of the producer being on specific markets/species potentially losing diversity in both production and markets

Corporate:

Includes a strong element of commercial orientation of a network between farmers, a service unit and an overall management unit. This model links multiple farmers to a corporate world of high demand, high quality, uniform products on time and in large amounts. The model requires significant capacity building and organisational development.

Other research undertaken by John Wiley and Sons Ltd have categorised business models in three ways:

- a) **Buyer driven models**: where contracts and agreements are driven more by market demand. Here processors, exporters and retailers maximise benefits by securing better contracts with producers. These models are facilitated through contract farming, micro franchising and joint ventures
- b) **Producer driven models**: production is driven by individual or groups of producers. Their main objectives are to serve new markets, achieve better market prices, stabilise market position, supply large volumes, increase bargaining power and access inputs and services. These models are facilitated by e.g., farmer owned business coops, tenant farmers etc

c) **Intermediary driven models**: where market actors focus on food safety, consistent quality, year-round supply and innovation at a competitive price. These models are facilitated by public private partnerships, certification etc

Methodologies: Wiley and Sons have outlined the many arrangements entered into which facilitate the operation of the various business models.

These include:

- a) **Contract Farming**: arrangements where larger commercial firms purchase the harvest of independent farmers based on terms and conditions agreed in advance. It often involves the provision of inputs such as seed, feed, credit, training etc. Such arrangements can address risk, mitigate market failures and reduce transaction costs. On the downside such arrangements can reduce producer autonomy while increasing their financial and production risks due to power imbalance. While this relationship is largely vertical it does not preclude horizontal arrangements between producers to counter potential imbalances and enhance negotiating power
- b) **Micro-franchising**: enables new market entrants to capitalise on existing knowledge, brands, products and processes in return for a fee. They operate under a firm's trade name but retain ownership. Like contract farming some arrangements include the supply of seed and feed etc. They are perceived as more autonomous arrangements than contract farming
- c) **Joint ventures**: involving co-ownership agreements between firms and producers. They overlap with other models with the key differentiating feature being the joint equity financing
- d) Farmer owned Businesses (cooperatives, associations, or groups): whereby producers pool their resources together using a formal organisational structure e.g., associations, trusts, cooperatives or collectives. Farm owned

businesses differ in that they are incorporated as enterprises leading to greater focus and speedier decision making than an all- inclusive cooperative model requiring collective decision making. There is a perception that larger businesses are averse to working with cooperative models because of their slow decision making. Cooperative/Farm owned models can include a significant level of horizontal and vertical integration

e) Public Private Partnerships: whereby an enabling environment is created for private investment and producer development. The best example are aqua parks where regional or national authorities designate a particular area for aquaculture development and offer major incentives to businesses to develop the resources, provide services and access the specialist expertise when necessary to maximise the utilisation of available resources. These facilities can also include incubators nurturing early-stage enterprises through the difficult and financially challenging start-up phase. This can also be complemented by accelerator programmes to fast-track increased management capacity, engagement with customers and interaction with financiers.

Key learnings regarding Aquaculture Business Models

Below are set out some key learnings regarding aquaculture business models that may be useful to existing and future aquaculture businesses in the Atlantic Area in overcoming the barriers outlined above:

a) It is of paramount importance for producers that a competitive, sustainable route to market is available. Access to this route to market or its competitiveness market may change over time. For example, currently the "just-in-time" land bridgemodel for shipping fresh seafood produce from Ireland, which has worked well for many years, is now seriously threatened by Brexit. Another example is direct sales. This can be described as an inversion of the value pyramid. The producer can sell less quantity for more per unit. As a result, this makes the producer less dependent on high volume low value selling less.

- b) Public investment is required to ensure an enabling environment for business to commence and thrive. This includes the provision of physical infrastructure e.g., port facilities and transport links
- c) "Incubator" and "Accelerator" programmes for the aquaculture sector would be helpful in supporting the business development capacities of aquaculture entrepreneurs
- d) The evolution of aquaculture specific financial instruments that recognises risk and timetables associated with the sector should be encouraged. This may include elements of grant-aid and social finance until such a time as the business demonstrates its capacity to engage with normal finance providers
- e) Enable the availability and use of technology to enhance production techniques, improve quality, capture market opportunities, assist innovation, and minimise the administrative and regulatory burden
- f) Maximise the connections for aquaculture producers with R&D facilities locally, nationally and internationally to ensure access to for e.g., cutting-edge technology and emerging consumer trends
- g) Support the development of culturally sensitive business models that maximise horizontal and vertical integration into the value chain where appropriate. The West of Ireland has been shown to be an exhibit of underdevelopment. A fisheries example was employed by O'Boyle (2020) one which is instructive for the aquaculture sector: the infrastructure for fishing in Ireland is centred around Donegal and Cork and landings have decreased in the West in recent decades as a result. Aquaculture is missing a hub in the West.

4.4 New sustainable aquaculture techniques in the Atlantic Area Region

As part of the programme of work included in Work Package 6 of the Access2Sea project, Action Four involved Project Partners undertaking to research and analyse new aquaculture techniques being developed in their regions. This research is aimed at fostering a more sustainable industry by facilitating the dissemination of techniques which could be of value in addressing the needs of companies in other territories of the Atlantic Area Region.

Table (i) below lists a selection of the new, sustainable aquaculture techniques which were identified by Access2Sea Partners across the five regions involved in the project.

Region	Technique	Reference/Link
Welsh Region	Biolpilic living presentation: a 44 unit residential building in Swansea city centre with aquaculture in the bottom floor with waste from the fish being used to grow plants for consumption on the flat roofs	http://biophilicliving.co.uk
Welsh Region	Cleaner fish investigation of the efficiency of U. intestinalis as a component of a land based integrated multi-trophic aquaculture (MTA system)	https://thefishsite.com/articles/ lumpfish-papers-win-swansea- awards
Welsh Region	Ocean Matters – Production of lumpfish to clean salmon of sea-lice	http://www.oceanmatters ltd. co.uk/facility
Welsh Region	Câr-Y-MÔr – Community Benefit Society implementing 3D ocean farming – a system that grows a mixture of seaweed crops and shellfish – including mussels and oysters – under the water's surface	https://carymor.wales
Welsh Region	WalesACE – Aquaculture Centre of Excellence, Swansea University	https://www.swansea.ac.uk/ bioscience/csar/projects/ walesace/
Andalucia Region	Sustainable Wetlands Aquaculture – Sustainable use of wetlands within protected areas (or not) for extensive/semi extensive marine aquaculture activities	Walton, Mark & Vilas, Cesar & Canavate, Jose Pedro & A., Prieto & Van Bergeijk, Stef & Medialdea, J.M & M, Librero & N., Mazuelos & King, Jonathan & Oc, Lee & Le Vay, Lewis (2015). Policy guidance for Sustainable Wetlands Aquaculture. 10.131.40/RG.2.1.4579.7203
Andalucia Region	Integrated Multi-Trophic Aquaculture – an integrated culture of organisms of various species belonging to different trophical levels in the same water body	http://integrate-imta.eu/category/ training-materials/ http://integrate-imta.eu/category/ downloads
Irish Region	Smarter Aquaculture – a multi tenanted, cloud-based system where aquaculture users can upload, store and analyse key farm production data	http:tssg.org/projects/smarter- aquaculture
Irish Region	AquaFarm is a novel modular recirculating aquaculture system (RAS) that enables low cost farming of aquatic species in high density	http://dit.technologypublisher. com/files/dit-technoloty-to-license- aquafarm.pdf
Portuguese Region	Atlantik Fish Production Mode	https://www.atlantikfish.com/en/ productionmodel/

Brittany Region	 Innovations presented at the Salon National de la Conchylicutlure et des cultures marines, including: Creation of a storing tray for closed systems (SMO SERVICE MAINTENANCE OSTRÉICILE) New range of ultr-light and economical bio-composite sieve tubes. Global solution for the purification of shells (Polyway) New heat pumps and cooling units to cool or heat up basins (aquassys) New light working coats and equpment for aquaculture workers (Aquavitex) Oyster tracker software to manage aquaculture farms (Erueka Mer) 	https://www.salon-ostreiculture. com/en/innovations
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Further Information on Sustainable Aquaculture Techniques papers completed as part of the Access2Sea project is available here: http://access2sea.eu/wp-content/uploads/2020/09/New-Sustainable-Aquaculture-Techniques-Overall-Report-FINAL.pdf

4.5 Access2Sea Technology Transfer Roadmap

A Technology Transfer Roadmap has been developed by the Partners in the Access2Sea project as a methodology for the transfer of these new sustainable techniques transnationally across the project.

There are six stages to the Technology Transfer process as follows:

Stage 1. Map existing sustainable aquaculture techniques

Stage 2. Engage with Research Facilities to identify new and emerging techniques

Stage 3. Foster key collaborations and strategic partnerships with industry, state agencies and other stakeholders for the purposes of knowledge sharing and dissemination

Stage 4. Utilise Access2Sea Partnership to provide the signposting and introductions between research facilities and companies, and for identification of funding sources for pilot activities

Stage 5. Carry out technology transfer for pilot implementation

Stage 6. Measure and evaluate key performance indicators of technology transfer

Figure (i) below outlines the six stages of the Technology Transfer Roadmap



4.6 Access2Sea Business Supports and Business Missions for sustainable development

WestBIC, the Official EU Business and Innovation Centre for the West and Northwest of Ireland, is the Lead Partner responsible for the coordination of WP6 on Access2sea. Action 5 of this work package seeked to encourage SMEs to take part in Inter-regional Learning Missions, thus encouraging knowledge sharing about the opportunities and challenges facing colleagues in other partner regions. Although this action was severely impacted by the Covid pandemic resulting in several postponements, the project delivered an attractive a series of business missions in each partner region.

We would like to thank all the organisations and SMEs who allowed us to visit during the Access2Sea Business Missions – without their cooperation these missions would not have been possible to organise. We would also like to thank all participants from SMEs and other institutions for participating in the business missions.

Portugese Business Mission

The Portuguese Business Mission was held on the 28th September 2021 in Matosinhos and was organised by CIIMAR.

French Business Mission

The French Business Mission was held in Brest on the 15th and 16th December 2021 to coincide with the Ocean Hackathon and was organised by Investir en Finistere.

Irish Business Mission

WestBIC, in association with Údarás na Gaeltachta organised a Business Mission to coincide with Access2sea Final Event and Steering Meeting in Galway on the 17th to 19th May 2022.

Welsh Business Mission

The Welsh Business Mission was organised by Swansea University, to coincide with the "Advancing Aquaculture within the Blue Economy" event in Swansea on the 16th and 17th of September 2022.

Spanish Business Mission

The final Business Mission was held in Cadiz on the 24th January 2023 to coincide with the Access2Sea Final event and was organised by CEEI Bahía de Cádiz and CTAQUA.

An Overview of the Pilot Projects implemented within the Access2Sea project

The pilot projects carried out as part of Access2Sea aimed to improve the business environment and the growth and jobs creation of the aquaculture sector in the Atlantic Area by addressing the key factors that impact companies' performance and sustainability.

Five pilot projects were carried out as part of Access2Sea. These pilot projects did the following:

- 1. Tested spatial approaches to installation of aquaculture projects
- 2. Tested the introduction of innovation on existing aquaculture farms to increase profitability
- 3. Tested the development of a smart facility for storage and processing of algae and shellfish
- 4. Tested the efficiency of the Access2Sea social acceptance methodology and tools
- 5. Provided computer software for training and reducing production costs for stakeholders.

5.1

Pilot Project 1: Experimental pilot project aimed at testing spatial approaches to installation of aquaculture projects

Background

This action was carried out by Investir en Finistère (IEF) and Technopole Quimper-Cornouaille (TQC). IEF is a non-profit organisation that brings together the 27 largest companies in Finistère and consular chambers. In recent years, IEF has carried out actions to support the development of marine aquaculture and biotechnology activities, particularly by deploying a spatial planning approach.

Objective

The main objective of this pilot project was to provide clarity on the different stages of the installation of an inland aquaculture site. Aquaculture professionals testified to numerous difficulties in their search for sites on land to install new aquaculture farms. Their needs are for suitable development sites located on the coasts. In such locations development, licensing and planning constraints are important, whether defined as regulatory (coastal law, remarkable areas, NATURA 2000...), societal (acceptability, cohabitation with other activities...), technical (pumping installation, discharge, water quality...), which restrict the possibilities when installing an inland aquaculture site

Design

This pilot action aims to:

- increase the knowledge and skills of the project partners regarding the identification of the best sites and technical requirements for installing aquaculture projects.
- raise awareness of public authorities in local areas to consider the installation of aquaculture activities through clarification on the stage required to install an inland aquaculture site in coastal areas.

Implementation

With the support of local aquaculture stakeholders and a consortium of aquaculture consulting firms, Investir en Finistère and Technopole Quimper-Cornouaille have created a technical document that explains the different stages to be analysed when installing an inland aquaculture site. This document is published in the form of a "methodological guide for equipping a land-based aquaculture site". It is intended for aquaculture entrepreneurs and technicians of public organisations in coastal areas that can support the establishment of aquaculture sites in their territory. The local follow-up committee was involved along all the steps.

Assessment

After discussing with the external expertise consortium and local follow-up committee (LFC), the decision was taken to elaborate a grid of ratios for each aquaculture sub-sector and produce a methodology in order to explain how to set up an aquaculture farm on land (technical and regulations constraints) with a focus on two potential sites (experimentation)

The co-construction was based on the external expertise (SAFI/Idée Aquaculture/Safège) and LFC composed with 10 partners gathered throughout 6 meetings and local stakeholders (mayors and technical agents of selected sites).

The meetings with the Local Follow up Committees helped to verify and validate the information at each step. They regularly read the guide and added modifications and suggestions. Investir en Finistère and Technopole Quimper-Cornouaille visited various sites to compare the methodology with conditions in situ.

Transferability

Investir en Finistère and Technopole Quimper-Cornouaille printed the guided and sent it to all stakeholders concerned (available in English and French). This document is available on the Access2Sea Website.

A 4 page leaflet was edited.

Examples of action of promotion/communication

- Round-table during the IEF's General Assembly (50 attendees)
- Dedicated workshop with LFC (10 people)
- 4 page Leaflet sent to the mayors of coastal municipalities (116 mayors)

- Information presented orally during events such as Idealg and Campus Mondial de la mer-Leaflet distributed during Professional Exhibition (Salon de la Conchyliculture)
- Communication on website social networks
- Guide sent to EPCI Presidents/deputies and senators/Prefectures/Brittany Region/ professional Partners (33 people)

In response to a demand from the partners, the guides were reprinted and 200 exemplars were distributed to them.

5.2

Pilot Project 2: Experimental pilot project aimed at testing the introduction of innovation on existing aquaculture farms to increase profitability

Background

This action was carried out by the Andalusian Aquaculture Technology Center (CTAQUA) together with Bay of Cadiz Foundation for the Economic Development (CEEI), both located in El Puerto de Santa Maria in the province of Cadiz (Spain). CTAQUA works to respond to the needs of the aquaculture and seafood sectors, developing custom-tailored solutions for their different technical and production processes. CEEI Bahía de Cádiz, from the stimulation of investment, job creation and innovative culture, the application of innovation in the industrial fabric and services in the surroundings of the Bahía de Cádiz, carrying out for this, different activities and offering comprehensive consulting services for guidance and support to business projects.

Objective

The main objective of the pilot project is to provide a local SME with the necessary technology and advice to improve its profitability, through a diversification proposal made subsequent to an analysis of its business model and cultivation techniques. The company was supported in improving its business model, applying the learning of the Access2sea Business Model, combined with technical support to improve its profitability.

Design

The main tasks of this pilot action were to propose a technical improvement in macroalgae cultivation indoors (lab conditions) and outdoors (earthen ponds), to design a low energy land-based seaweed cultivation system and to acquire knowledge on the algae drying process to increase its productivity and sustainability. An additional objective was to assess the business model and technical production to provide advice for a local SME.

Cultivation design

The pilot action was designed to test the viability of macroalgae production of different species *Codium tomentosum, Codium decorticatum, Gracilaria gracilis, Gracilariopsis longissima* and *Chondracanthus teedei*) during two consecutive years (2021 and 2022) between February and June. These months were selected due to environmental conditions and the suitability in the Tsiane production cycle, as during this period of the year the sluices allow for a near-continuous flow of water, at the same time maintaining a sufficient high water level for seaweed cultivation

Seaweed dryer experimental design

The pilot action was designed to optimize the use of the solar prototype drying system in terms of the time required for drying, increasing knowledge about how the external temperature and humidity may interfere in the drying process of Ulva spp.

The main aim was obtaining a biomass with an internal water content between 10-20% as maintaining stable product RH < 20% to secure seaweed food safety (Forster & Radulovich, 2015).

Implementation

Macroalgae cultivation in earthen ponds

Gracilaria gracilis, Gracilariopsis longissima and Chondracanthus teedei were seeded in different ways according to the type of substrate to be tested and placed on a raft in order to be able to maintain the cultures always at the same depth regardless of the tides, PVC rectangular structures were used. The different substrates with the algae seeded on them were placed.



G. gracilis, *G.* longissima and *C.* teedei were seeded from thallus fragments of circa 10 cm, inserted in 5 mm polypropylene ropes by specie attached to the raft. The weight of these fragments corresponded to the initial fresh weight of the culture.



Three culture ropes were set up for each species as replicates. The fragments were placed on the ropes in the laboratory 3 hours before they were placed in culture. The baited ropes were taken to the estuary in cold and dark, and once there, they were placed in the rafts and arranged in the culture area.

Protoplast seeding culture in laboratory conditions

C. tomentosum and *C. decorticatum* trials were carried out according to the methodology used by Hwang *et al.* (2007). The preliminary steps of cell fixation were placed on cultivation strings. The strings used were 5 cm wide strips (AlgaeRibbon from AlgaeTex) and also on three biodegradable strings of 2 mm diameter, and one of 1 mm diameter in collaboration with BIOGEARS project leaded by AZTI and then wound onto 5 mm braided polypropylene strings.

Macroalgal dryer improvement

For the development of extensive aquaculture in estuary areas, the autonomy of instrumentation is crucial. Therefore, to include seaweed culture in a company, knowledge on its proper processing is required. The first prototype of a macroalgal dryer that uses solar energy was designed in the framework of the BIOSEA project, however, to optimize its efficiency in the Access2sea project, CTAQUA has worked on the introduction of some technical and methodological improvements.



In terms of methodological improvements, three trials were carried out during five days each to optimize the time required on the dryer process according to environmental conditions such as external temperature and humidity. Moisture content (%) was monitored three times per day (9.00, 12.00, 18.00 h) every day. The experimental period was extended during August 2022. Biomass of Ulva spp. used for each experiment were 9 kg, divided in three shelves of the dryer chamber.

Land-based low energy cultivation system

Biological requirements for efficient seaweed cultivation purposes were identified. Hence, the components that should be included in the recirculating aquaculture system for macroalgae. Due to the interest in designing an autonomous system that does not demand extra energy, solar panels and batteries were included as power source.

Business model development

CEEI carried out the evaluation of the business model, supported and monitored the SME for the improvement of business strategy, and finally implemented the business model developed during the execution of the project fostering the online market, creating a bespoke tool.



Business model assessment was developed through an initial diagnosis of the company, has supported and monitored the SME for the improvement of the economic-financial strategy, carrying out an economic analysis and establishing objectives and indicators. Finally, the business model developed during the execution of the project has been implemented, creating a customized electronic commerce platform for the company so that it can expand its client portfolio, can generate a larger operating account, generating greater profitability in the business.

Assessment

Regarding the objectives for new aquaculture installations, the tasks to develop where defined before previous Assessment of the Business model and Technical bottlenecks of the SME supported, considering the transferability to the aquaculture activities placed in a natural asset. Another evaluation was carried out to assure the feasibility of the actions tested, and therefore, stablish advice and analyses the risks to short and medium term for the business.

Transferability

During project execution, Access2Sea website and social networks have had a key role in the dissemination of actions, methods and results, above all in the middle of the health crisis of 2020. However, CTAQUA has worked at the extensive creation of communication material such as project leaflets, WP7 leaflets, three different infographics, newsletters and Layman's reports. These contents have been physically distributed in:

- LFC: Tourism and aquaculture Alliance for Sustainability (25 attendees)
- Stand at the National Aquaculture Conference in Cádiz (Spain) (300 attendees)
- 9th Atlantic Stakeholder Platform Conference, celebrated in Spain (2221 attendees).

LFCs are essential for the transference of knowledge and the detection of issues which a SME may be facing. In addition to provide an atmosphere to generate a discussion and be able to obtain a framework of possible solutions.

CTAQUA as an innovation center in charge of knowledge transition to the business sector, designed each activity carried out for the Pilot action 2 considering transferability. Most of the experimental trials have been placed in the supported enterprise to facilitate the upscaling and detect bottleneck associated.

5.3

Pilot Project 3: Experimental pilot project aimed at developing a smart facility for storage and processing of algae and shellfish

Background

Údarás na Gaeltachta and WestBIC carried out this pilot project with a cooperative of shellfish farmers, Comharchumann Sliogéisc Chonamara Teoranta (CSCT). CSCT are based in the Connemara Gaeltacht, in co. Galway on the west coast of Ireland. CSCT fish native oysters and scallops. Stock levels are enhanced by sustainable aquaculture techniques and are exclusively fished under an aquaculture license.

Design

This pilot action aimed to:

- provide infrastructure and equipment for the shellfish producers to store their produce giving them an option to either sell directly to wholesalers on the pier side or to store them and sell them directly to consumers thus enabling them to receive a higher value for their produce
- increase the knowledge and skills of the local shellfish cooperative on food safety handling

Implementation

The pilot project aimed to fit-out a shellfish cold storage and processing unit using a novel live storage technology. Initially it was proposed to kit out a mobile unit and to locate this close to the landing site of the shellfish, however due to regulatory issues this approach was not pursued. Following a search of existing fish processing units in South Connemara, a suitable unit was located next to Breizon Fish Processing company in Ros an Mhíl.





To deliver seafood directly to the market, the unit required authorisation from the Sea Fisheries Protection Authority and Bord Iascaigh Mhara, Ireland's Seafood Development Agency. To this end, CST has applied for the necessary permits but is currently awaiting those permits.



The cold storage room is now built. The unit is split into two parts – a dry cold store room located in the Breizon factory and a live storage centre on Cill Chiaráin harbour. Both centres have now been approved by the Sea Fisheries Safety Authority. Live shellfish shall be allowed to be kept in two baths: the live monitoring system, funded by Access2Sea and the water-cleaning and monitoring system, is provided by Bord Iascaigh Mhara.

The following equipment has been purchased for the unit:

- KATSBRD1200 Atlas Single Bowl Sink SBRD1200
- Vogue Stainless Steel Midi Pot Wash Sink with Undershelf
- KATWB1200 Atlas WB1200 Wall BENCH w/ undershelf
- KATEBF05 Atosa EBF-05 Blast Chiller 5 Pan
- NEVNACS15 Scales Digital 15 kg Limit

- BTA300151 Digital Scale 150 kg, 50 g
- GAS7950.5020 EcoFrost Freezer 2 Door
- Boss MAX 42 Vacuum Packing Machine
- Wheelie bin, Ecostore Wheelie bin 1,100L
- Mobile printer Labelling, Zebra m.s.
- TMC monitoring system
- Water Boiler
- Cold room 80 mm Optima Walk-In Freezer 3200 x 1600 x 2 000 mm

The co-operative also reached an agreement with the Galway and Roscommon Education and Training Board to provide a seafood safety course for members of the co-operative. The HACCP course was completed in October 2022.

Assessment

This pilot had the objective of adding value to seafood produce by creating cold storage and processing facilities for the producers where the produce could be stored for a period by producers and sold at an optimum market value directly to consumers. Secure storage enables supply continuity and market access and thereby added and increased value.

The challenges faced by CSCT has highlighted the lengthy period, expense and expertise required to obtain the necessary permits from state authorities to undertake the storing and processing of seafood in Ireland. It also highlighted the need for fishermen to undertake basic food safety courses if handling seafood and processing seafood beyond the landing point.

Transferability

Wild shellfish are fished rather than farmed. Stock levels are enhanced by sustainable aquaculture techniques and exclusively fished under an aquaculture license. Secure storage enables supply continuity and market access and thereby added and increased value. The innovation/technology transfer is increasing value at the end of the value chain by adding and increasing value to the product. In other words, ensuring continuity and regularity of supply by enabling fishers to sell their product at the optimum market price. The project dovetails with other ongoing research, monitoring and stock management through national institutions and European projects. The pilot has developed additional partnerships with Breizon and BIM and with Atlantic Technology University and the EU project Aquavitae and with the assistance of the relevant authorities is close to achieving a working model. CSCT has identified local markets for sales and believes that 60 % added value can been added to the agreed prices.

5.4

Pilot Project 4: Experimental pilot project aimed at proving the efficiency of the Access2Sea social acceptance methodology and tools

Background

The Centre for Sustainable Aquatic Research (CSAR) in Wales was responsible for Pilot Project 4.

Objective

The aim of this project was to develop innovative and complementary solutions to improve lumpfish welfare aquaculture practices. Fish welfare is a controversial topic which is impacting the social acceptability of salmon farming. Every year 50 million lumpfish are deployed in salmon cages to eat sea lice - a parasite that feeds on the skin of Atlantic salmon. Consumers and retailers generally support the use of cleaner fish to control sea lice but only if the welfare of lumpfish is not compromised. The tool developed in this pilot will allow fish farmers to monitor and record the welfare of lumpfish and take remedial actions. Four innovative and complementary solutions were developed, spanning TRL7 to TRL9, to help farmers monitor the welfare of lumpfish and take remedial actions:

- 1. A diagnostic welfare scoring chart that can be used by fish farmers on site
- 2. An online BMI calculator to detect underweight lumpfish
- 3. An online Rapid Welfare Assessment tool for lumpfish
- 4. An e-training platform

Design

CSAR researchers developed and validated a rapid Lumpfish Operational Welfare Score Index (LOWSI) in collaboration with salmon and lumpfish farmers. This followed a step by step process, where initially biometric and welfare data as recorded from fish hatcheries and salmon farms. Stakeholders were consulted and an initial prototype of the scoring index was presented in a workshop and optimized following farmers recommendations. Once the LOWSI was optimised we worked with fish farmers, software developers, and designers to create the tool.

Implementation

CSAR researchers developed and validated a rapid Lumpfish Operational Welfare Score Index (LOWSI) in collaboration with salmon and lumpfish farmers. Our aim is to make this index accessible to farms by developing The Lumpfish Welfare Watcher a web-based application that will calculate the BMI (relative weight) of lumpfish, determine the proportion of fish that are emaciated, underweight, and normal, along with recommendations for action. The application also calculates the Lumpfish Operational Welfare Score Index (LOWSI) based on four visual indicators (skin damage, eye condition, caudal fin damage and suction disc deformities) and the BMI.

It also calculates the probability of escape from salmon net pens with nets of various mesh sizes. The Lumpfish Welfare Watcher application package includes a user manual, a lumpfish Welfare chart and a e-training course that was disseminated via YouTube video, Workshop sessions, magazines and expertise journals.

Pilot Transferability

The following tools were developed to ensure transferability of the pilot outputs.

- BMI calculator available to access online and to download https://bsciweb.swan.ac.uk/ lumpfish/
- User Manual: available online to download
- The welfare chart is available to download on the Lumpfish Welfare watcher website



LUMPFISH WELFARE CHART

The Lumpfish Operational Welfare Scoring Index (LOWSI) is a rapid and validated method to assess lumpfish welfare based on the assessment of four visual indicators: skin damage, caudal fin damage, eye condition and sucker deformities, and a fifth indicator based on the body mass index (BMI), also known as relative weight. The BMI indicates if lumpfish have a normal fish weight.



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The software tools and the chart were distributed as follows:

The chart was sent to 22 institutions during an interview survey conducted by a consultant company to provide feedback and quality assurance. The chart was printed and distributed to 75 farmers at the Lochaber Chamber of Commerce Ideas week The chart was printed and distributed to 50 stakeholders during the Aquaculture UK event in May 2022. The software was explained and tested by the farmers in the above events. On the 25th of May 2021 CSAR hosted a webinar entitled: Application of sensors in precision aquaculture: presentation available to download. Dr Sara Barrento gave a talk where she introduced the lumpfish welfare watcher. A total of 157 participants from 33 countries attended the webinar (#aquasensors).

A online webinar on the Lumpfish Welfare Watcher is available on **YouTube**.

5.5 Pilot Project 5 Experimental pilot project aimed at providing computer software for training and reducing production costs for stakeholders.

Feed Intake Regulation as a Tool for Waste Management in Fish Production

Background

CIIMAR – Interdisciplinary Centre of Marine and Environmental Research in Porto was responsible for carrying out this pilot project.

The aquaculture sector has been expanding. However, its commercial success is overshadowed by the growing impact of the discharge of pollutants on marine and coastal systems (Braña et al., 2021). Accordingly, over 50% of the nitrogen supplied through the aquafeed is lost to the aquatic environment, directly from the unconsumed feed and/or from the oscillations in fish feed efficiency due to environmental changes and feed quality. Besides exacerbating the environmental impacts of aquaculture production, inappropriate feeding and feed management can therefore be detrimental to the profits of farmers, as feed costs account for up to 60% of total production costs (White, 2013).

As the production of fish biomass is ultimately based on the feed consumption of individual fish, a model able to simulate feed intake based on available fish species, reared under different husbandry conditions (e.g. water quality, diet composition and feeding strategies), would be extremely useful to reduce waste discharges from aquaculture fish farms.

Over the past decades, several explanatory simulation models for fish growth of a wide variety of freshwater species have been developed from basic concepts underlying growth (Zhang et al., 2020). To date, limited predictive tools were developed for marine fish species using regulatory mechanisms controlling feed intake (Assan et al., 2021; Chen et al., 2020; Hassan et al., 2016). Feed intake is an essential input for any explanatory model of fish growth processes. Understanding how fish control their feed intake may help the aquaculture sector designing feed and feeding strategies to optimise production, minimising feed waste. However, little effort has been devoted to the prediction of maximum feed intake in marine fish under different husbandry conditions.

Among a wide range of factors involved in feed intake regulation, water temperature and salinity are the main variables. The overall hypothesis is that feed intake and conversion rates are tightly linked to fish size and water temperature and salinity.

Objective

The aim of the pilot is to minimize the waste of unconsumed fish feed and reduce the operational costs by developing a simulation model based on experimental data. The model foresees feed intake, by considering some of the regulatory mechanisms related to water temperature and salinity. This supportive tool intends to provide information and guidance for the aquaculture stakeholders to optimize fish feeding through minimum waste production and reducing production costs.

Design

The pilot is designed according to Figure 6.1. It involves the participation of CIIMAR and FoodinTech. CIIMAR conducted the lab trials and used the results to support model development in Python, through regression techniques. The formulation of a best-fitted model is carefully analyzed, and then sent to FoodinTech, which embedded it within FLOW-M technology. After the model is available through FLOW-M technology, input variables (i.e. water temperature, salinity, sampled fish weight and quantity, overall fish quantity in tank, fish mortality) are manually inserted and the model is run. Expected output should comprise the predicted number of fish feeding to add to the tank, giving the water temperature, salinity and fish weight.

To facilitate a continuous monitoring and management of the fish production, both input, model parameters and model output is available on a visualization tool. When populating the database with more entries, the plots and graphs for visualization are automatically updated. Moreover, it allows an objective selection of the desired time span, from daily, to weekly, quarterly, monthly, semester and yearly scales.

Implementation

Regarding the activities of the present action, the planning and execution of three fish trials aimed to gather experimental data to ultimately support the development, fitting and validation of a numerical model, foreseeing an optimization of fish intake accordingly to fish weight, water temperature and salinity (Figure 6.2).

The results of all trials produced a final dataset, subjected to data analysis methodologies. This dataset was to be randomly split, in order to select a sub dataset for model fitting (model construction) and an independent one for model validation (assessment of its robustness and reproducibility). Also, at the end of fish trials 1 and 2, CIIMAR carried out tissue samplings, to perform biochemical analyses, to complement the model results (Figure 6.1).

The model formulation was incorporated in FLOW-M (https://flowtech.pt/en/home-3/), a MES technology – Manufacturing Execution System by FoodinTech. Afterwards, the FLOW database connects directly to a dashboard for data visualisation, produced in PowerBI (https://powerbi.microsoft.com/en-au/) (Figure 6.1).



Figure 6.1 Design of the pilot project



Figure 6.2 Summary of the adopted workflow.

The pilot implementation involved three major steps: Step 1) Lab trials; Step 2) Model development and performance; and Step 3) Integration of the model within FLOW technology & visualisation. Steps 1 and 2 have been carried out by CIIMAR and Step 3 conducted by FoodinTech and major activities are summarised in Figure 6.3.

Assessment

The pilot is online and working and available at: http://demoscomerciaisf2.foodintech.com/ PickApp.aspx?solution=Access2sea There are some system and software requirements, such as: 1) framework Microsoft .NET version 4.6.1 or higher; 2) browser – Internet Explorer; 3) Windows 10 – suggested Operative System. At the Audio-Visual material Section – Action 5, there are a couple of videos available to guide the user throughout the tool. The credentials to access it are: Log-in: Partner; Password: 0000. Pilot results are visualised in a dashboard, created in PowerBI (powered by Microsoft©).

Transferability

The tool developed during the pilot is ready to be used by the aquaculture sector, particularly those focused on the production of European Sea bass. It provides comprehensive information that promotes the reduction of aquafeed lost to the aquatic environment, as it considers major conditioning factors of fish feed intake, such as the fish weight and environmental factors (water temperature and salinity). Therefore, its readiness to be directly implemented in aquaculture production of European sea bass contributes to a better optimisation of fish feeding, reducing the environmental footprint and also keeping a more substantial control of the production costs, as up to 60% account for feed costs.



Figure 6.3. Workflow for model implementation.

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Main Results and Conclusions



6.1 Marine Spatial Planning

The implementation of the Access2sea Programme has provided robust evident that the implementation of Marine Spatial Planning (MSP) techniques provides an opportunity to address some of the physical, maritime and land-use planning constraints faced by actors within the sector as they seek to consolidate and develop new approaches to sustainable resource extraction and development. The practical cases analysed within the framework of the project are drawn from experiences in different partner regions. The management of the case studies allowed the Consortium to investigate and develop different relevant methodological aspects central to the development of such projects thus increasing the likelihood of more successful implementation of aquaculture projects along the European Atlantic coast.

Although there are difficulties in transferring learnings emerging from the deployment of different spatial planning models due to the highly localised nature of member state regulations, Access2Sea has provided some clear learnings which can be transferred throughout the Atlantic Area and used among the partner regions after the project has concluded.

Central to the programme's findings is that strategic engagement and cooperation with all stakeholders is essential for effective marine spatial planning where all stakeholders in any given area must be represented and heard within the planning process. Spatial planning for aquaculture poses unique challenges which can be better dealt with in a differentiated manner rather than being pursued within a general, overall marine policy framework.

In the case where aquaculture is prioritised within the framework of a local development plan, it must be reflected in the relevant legal provisions for it to be effective as planning measure as is demonstrated in the case study from Brittany. In this instance, aquaculture was given priority in terms of zoning protections rather than residential property development in particular circumstances where there was strong competition from different interest groupings for development space.

The learnings also demonstrate that licensing requirements must be simplified and made more accessible so as to encourage rather than discourage aquaculture entrepreneurship.

In Andalucía, advance planning by the administration is an effective strategic approach where a plan exists to identify optimal areas for aquaculture activity based on compatibility between activities in the same area and technical criteria such as depth and distance to the nearest port.

Tools and Supports

A Map of Opportunities was developed as part of the programme implementation. This mapping tool is aimed at providing information to existing and potential onshore and offshore aquaculture producers. This resource provides data concerning the best sites and investment opportunities for installing aquaculture activities in the regions involved in Northwest Region (Ireland), Wales (UK), Brittany (France), Andalucía (Spain) and Portugal. By clicking on the specific locations, project promoters and investors can find different spatial planning tools which have been improved or identified in the framework of the Access2sea project. These tools can in turn help assess the territorial opportunities available for establishing an aquaculture business. The map of opportunities can be found on the Access2Sea website at https://access2sea.eu/a2s-opportunities-map/. This planning resource will be kept up to date after the project comes to an end.

In addition, Investir en Finistère with its partner Technopole de Quimper Cornouaille and supported by professional federations and experts in Brittany developed a guide to support the development of new aquaculture sites.

This methodology guide is intended for:

- Entrepreneurs who are embarking on an onshore aquaculture project requiring seawater pumping, whether linked to an offshore concession or on their own territory and concerning different activities: shellfish farming, seaweed cultivation, fish farming, marine biotechnologies according to their specific needs,
- Technicians from public organisations and communities who are supporting a project on their territory or who wish to equip a site.

This methodology guidebook details and explains all the steps required to set up an aquaculture project on a new site from ratio and data to technical and legal indicators. It includes practical analysis grids and helps to assess the suitability of a site for an aquaculture enterprise.

Documents relating to Marine Spatial Planning are available at https://access2sea.eu/pages/ documents/#toggle-id-3

6.2 Social Acceptance

Access2sea has identified that strategic engagement and cooperation between all stakeholders so as to facilitate their participation in decisions concerning aquaculture farms is essential for effective spatial planning, as well as contributing to improved social acceptance.

As outlined earlier in the report, one of the principal obstacles to the development of aquaculture activities concerns the low level of social acceptance within the community. To address this issue, Access2Sea conducted a number of regional communication campaigns to promote aquaculture products and the aquaculture sector, in general. Access2Sea assessed levels of social acceptance in the project territories and identified methodologies and initiatives that had proven to be efficient in improving social acceptance, some of which are summarised below.

Communication is crucial in gaining social acceptance. It was found that respondents wanted an opportunity to react, explain their concerns and their point of views in relation to proposed aquaculture activities in their areas. In an example from Brittany, Christophe Chabert found transparency with local stakeholders in relation to wind farm developments to be of central importance in acquiring social acceptance.

Cooperation and allowing all relevant stakeholders to participate in decisions concerning aquaculture farms will improve social acceptance as it increases trust between stakeholders and enables stakeholders to feel more respected and considered.

Tools and Supports

An inventory of the methodologies and initiatives to improve social acceptance of the aquaculture sector was provided as part of the Acccess2Sea project. In addition, a strategy, methodology and road map for future aquaculture development was provided. There is growing concern regarding the welfare of farmed fish particularly in salmon farming. NGOs have raised concerns about lumpfish welfare which are used on salmon farms as the lumpfish feed on salmon lice. The University of Swansea, an Access2Sea partner, has developed an innovative pilot project which allows fish farmers to ascertain lumpfish welfare. As part of a pilot project carried out in Wales, four innovative and complementary solutions called the Lumpfish Welfare Watcher were developed to help farmers monitor the welfare of lumpfish and take remedial actions:

1. A diagnostic welfare scoring chart that can be used by fish farmers on site

- 2. An online BMI calculator to detect underweight lumpfish
- 3. An online Rapid Welfare Assessment tool for lumpfish
- 4. An e-training platform

This tool is a web & desktop interface designed to help fish farmers assess and improve the welfare of lumpfish based on the validated operational welfare score index known as the Lumpfish Operational Welfare Score Index or LOWSI. The tool can be found at https://access2sea.eu/lumpfish-welfarewatcher/



6.3 Business Model Development

It is of paramount importance for aquaculture producers that a competitive, sustainable route to market is available for their products. Access to this route to market and competition in the market may change over time. For example, currently the "just-in-time" land bridge-model for shipping fresh seafood produce from Ireland, which has worked well for many years, is now seriously threatened by Brexit. Another example is direct sales (see reference to producer-driven models in Section 1). This can be described as an inversion of the value pyramid. The producer can sell less quantity for more per unit. As a result, this makes the producer less dependent on high volume, low value selling less.

Public investment is required to ensure an enabling environment for business to commence and thrive. This includes the provision of physical infrastructure e.g., port facilities and transport links.

"Incubator" and "Accelerator" programmes for the aquaculture sector are considered helpful in supporting the business development capacities of aquaculture entrepreneurs. The findings also confirm the need to encourage the evolution of aquaculture-specific financial instruments that recognise risk and timetables particular to the demands and opportunities associated with this particular economic sector. Such instruments might likely include elements of grant aid and social finance where such supports are critical to enterprises until such a time that their business models demonstrate capacity to engage with the normal finance providers. Findings also argued the need to enable the availability and use of technology to enhance production techniques, improve quality, capture market opportunities, assist innovation, and minimise the administrative and regulatory burden.

Maximising the linkages and synergies with local and regional R&D facilities, as well as establishing national and international links to ensure access to e.g., cutting-edge technology and emerging consumer trends, were also highlighted within the Programme's findings in this domain of work. Finally, measures to support the development of culturally sensitive business models that maximise horizontal and vertical integration in the value chain were considered highly relevant and desirable.

Tools and Supports

The Access2Sea project provided an inventory of existing SMEs in the partner regions and a profile of aquaculture business models. It identified innovative and sustainable aquaculture techniques which can be used by aquaculture producers. These can be found at the following link: http://access2sea.eu/ wp-content/uploads/2020/09/New-Sustainable-Aquaculture-Techniques-Overall-Report-FINAL.pdf

The programme also provided a Technology Transfer Through providing direct business Roadmap. supports and administering a series of transnational business missions, the programme provided opportunities for transnational learnings during the project. This opportunity for innovation was further demonstrated during the implementation of the Access2sea pilot projects in Ireland and in Spain. This was evident in terms of technical designs and modelling tools supported by financial advice where, combined, such measures ensured competitivity and market diversity. Access2sea pilot project results have been provided to the aquaculture sector and the general public alike who have access to advice concerning the implementation of several tools in order to identify novel business opportunities.

Dissemination and Communication

7.1 Main Capitalisation Actions undertaken during the Access2Sea project

Short-term Measures: Diagnostic and Mapping Tool for Capitalisation

In the early stages of the project a Diagnostic

and Mapping tool was developed which allowed Access2Sea partners to jointly gather and analyse the available knowledge in the Access2Sea territories with a particular focus on previous AA projects as well as other EU-supported projects.

7.0

The INTERREG Capitalisation initiative is an approach that focuses on collecting, analysing and disseminating the thematic knowledge gained from projects working on the same topic.

2.2 Overview of Capitalisation Report – why is it being undertaken		2.3 Methodology Employed – how was the data collected		
What areas of the aquaculture sector will this report examine?	What are the objectives?	Who are the target audience?	Methodology employed – how was the data collected?	What are the expected results?
Strategic, Policy and Institutional Framework	To increase the visibility if the programme and its impact on the policy making process at regional, local, national and European levels.	Decision makers: politicians and their professional staff involved in development of regional policy at local, regional, national or EU level.	This document is a conclusions report on the current state of the aquaculture sector in the Atlantic Area and is complied by Údaras na Gaeltachas based on an analysis of previous AA projects in the aquaculture sector and based on input from partner regions (see Appendix 1: Diagnostic and Mapping Tool: Baseline Assessment of the Aquaculture Sector).	The Access2Sea project (Interreg EAPA 1059/2018) consists of 10 partners from the Atlantic Area (Ireland, UK, France, Spain and Portugal). Result : Strengthen the transfer of innovation results to facilitate the emergence of new products, services and processes in the aquaculture sector.
Summary analysis of Aquaculture Sector	To better exploit the knowledge resulting from projects working on a similar topic for the benefit of local and regional authorities in Europe.	Programme bodies: members of the Monitoring Committee, MA, JTS, IPs	Individual Partner Reports: Ireland Spain UK Portugal France Appendix 1: Questionnaire – Diagnostic and Mapping Tool: Baseline Assessment of the Aquaculture	Aquaculture could boost economic development and job creation in regard to seafood by enhancing the exploitation and preservation of AA natural assets. Result : Creating new sustainable farms is a key element for the blue economy in the region. However, it is often constrained by complex acceptability. Access2Sea improves the attractiveness if the Atlantic shore for aquaculture SMEs by enabling new business opportunities and providing sustainable and easier access to it.

Summary of key supports for Aquaculture Development	The Access2Sea project seeks to capitalise on the learning achieved through previous AA projects in the aquaculture and related sectors including the NETALAGAF, SEAFARE, INTEGRATE and ATLANTICBLUE- TECH projects.	End-users (ie the people directly affected by the projects) and other interested people living in the area around the projects' activities.	Analyse the projects NETALAGAF, SEAFARE, INTEGRATE and ATLANTICBLUETECH features and results and identify their added value in their specific thematic field. Complied by Údaras na Gaeltachta with the support of the Project Officers. Identifying analysing and interpreting patterns of meaning within qualitative data.	As only 10% of Atlantic shore seafood is aquaculture-sourced there is great opportunity for raising AA aquaculture production in a sustainable way which is the main goal of Access2Sea. The objective is to enhance the exploitation and preservation if the AA's natural assets by unlocking the existing barriers (legal/regulatory, technological, existence of suitable areas in coastal zones, social acceptance) to provide the industry with technical solutions to give the aquaculture businesses access to shore by enabling onshore production
Key challenges and constraints for Aquaculture Development	Access2Sea improves the cooperation between stakeholders, business support organisations, research institutes, national and regional administrations and local councils facilitating the innovation and knowledge transfer in the aquaculture sector.	Multipliers: journalists, regional agencies etc	The project partners contribute by providing all relevant information on thematic issues and participating in thematic workshops. The capitalisation initiative is followed by stakeholder groups per topic that gather interested parties (Member States, National and EU experts etc) who can contribure to the discussion	Enable SMEs to assess spatial opportunities to settle in the Atlantic shore new aquaculture business, supporting them in exploiting the natural assets in a sustainable way as well as in improving its performance through the improvement of their business model and be better accepted by local communities.

Capitalisation Report

An overview of current state of aquaculture in each of the partner regions was developed.

Mid and long-term measures

To ensure the exploitation of the project results, and thus the overall project sustainability in the mid and long-term, the following actions were undertaken to guarantee that the project outputs will be used after the project lifetime and applied to other contexts.

Final Conferences events

The organisation of final conference events in Galway, Ireland and in Cadiz, Spain afforded important opportunities to present the outputs of the Access2Sea project to local, regional and international stakeholders.

Creation of Local follow-up Committees (LFCs)

In the project regions, the LFC's purpose and role was to increase the participation of a broad range

of aquaculture stakeholders in the ACCESS2SEA project development and implementation.

The selection of people chosen for Local Follow-up Committees under the Quadruple Helix framework is derived from academia, industry, government, end users and society that will contribute to the value creation of Access2Sea's outputs. Based on developing an industry relationship network to gain insight and share knowledge on the various complex elements of offering improved cooperation between stakeholders, business support organisations, research institutes, national and regional administrations and local councils facilitating innovation and knowledge transfer in the Aquaculture sector. Supporting the Access2Sea partners to delve deeper into the aquaculture dynamics of their region and gaining a greater understanding of the complexities in the sector and building on their strengths to develop the value creation in their regions activities.

The feedback gathered from the LFC's in each of the regions formed the bases of the project position paper which addresses the existing barriers and provides new solutions and support to new and existing SME's to develop sustainable aquaculture initiatives.

Composition: The relational process taking place within a quadruple helix environment, where private and public organisations interact to create a process where value is added and the various inputs are transformed to valuable outputs for themselves and others. The strength in the process is that it is not controlled by a specific player. Following the Quadruple helix approach in each partner region, as outlined below, the LFCs comprised of regional aquaculture sector stakeholder representatives. It was recommended that there would be up to six representatives on each LFC. In some regions an existing advisory structure or forum may have served the purpose and role of the LFC. In some cases, additions to such existing structures may need to be made to ensure a broad range of representation.

LFC Meetings convened

A total of 17 meetings of partner regions LFCs took place with 260 participants during the Access2Sea project period.

Indicators	Target	Actual
Actions	6	17
Participants	36	260

Access2Sea would like to thank all LFC participants for their valuable contributions during the Access2Sea project.

'Action for Change' Paper

On the 27th June 2022, all Access2Sea partners made the following written commitment to ensure the long-term impact of the results from Access2Sea:

- 1. Engaging the relevant bodies in Access2Sea dissemination events.
- 2. Disseminating the tools created under Access2Sea and making them available to local SMEs.

- 3. Keeping the Access2Sea website live for five years after the project comes to an end, allowing aquaculture SMEs to access the resources.
- 4. Keeping the map of opportunities up to date with the latest opportunities in the regions.
- Continuing to refer to Access2Sea on our organisations' newsletters, websites, and social media.
- 6. Disseminate the findings of Access2Sea as part of yearly international maritime events.
- 7. Working to make aquaculture SMEs visible to international markets.
- 8. Keeping the partnership alive by organising occasional online meetings to discuss future possible collaborations and share learnings.
- 9. Presenting the findings from Access2Sea at national European Maritime Day events.

Position paper presentation meetings

An Action for Change Position Paper (Position Paper) was produced as part of the Access2Sea project and is based on the results and conclusions of the Acccess2Sea Project. The Position Paper will be used as a tool in continuing to support the project territories with the changes required for a sustainable aquaculture sector. The Position Paper looked at lessons learned in the partner regions and can be used to help other Atlantic Area regions in developing sustainable aquaculture activities that are socially accepted and recognised as adding value to local development.

The paper focused on the outputs and results of the Access2Sea partners and provided an overview on the main themes of the project namely spatial planning for aquaculture, social acceptance of aquaculture and business models to improve the business environment, growth, and jobs creation potential of the aquaculture sector.

The Access2Sea Position Paper was presented to regional, national and European decision and

policy makers including presentation meetings with national/regional ministries in each of the partner countries and finally to DG MARE to increase the visibility and long-term impact of the project achievements and to ensure that the project results and other achievements will be available for improving the social acceptance and sustainability of EU aquaculture sector.

To date the partnership has presented to the following number of meetings:

Indicators	Target	Actual
Actions	10	14

Further Information on Capitalisation outputs is available at: https://access2sea.eu/pages/ documents/#toggle-id-2

7.2 Communication Materials

A wide range of communication material has been designed to facilitate the dissemination and communication of the project information, results and conclusions. The contents have been disseminated to different stakeholders and members of the public to improve the attractiveness of the Atlantic area for the development of sustainable aquaculture.

Communication materials (leaflets, brochures, etc.) have been developed in local languages aimed at targeted groups. In addition, all the materials are open access and available for download as pdfs from the Access2Sea project website at www. access2sea.eu

Further information on Access2Sea Communication and Dissemination outputs is available: https:// access2sea.eu/pages/documents/#toggle-id-1 and https://access2sea.eu/news-and-events/

7.3 Networking

Dissemination and communication activities conducted during the Access2Sea project have provided enhanced opportunities for networking aauaculture stakeholders amona includina academia, SMEs, interested bodies and the general public. Many of these stakeholders have shown interest by contacting the project partners and participating in project events including supporting the development of business models, social acceptance and spatial planning of the aquaculture sector.

