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ProtoAtlantic: Innovation in the Marine Environment in the Atlantic Area Region

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Abstract— Blue Growth, a term first coined by the European Commission as “an initiative to harness the untapped potential of Europe’s oceans, seas and coasts”, identified rich marine resources as an unique asset for economic development in coastal regions and on islands. The European Commission has through the Blue Growth objectives for the first time highlighted marine sectors as unique market opportunities with high growth potential which carry socio-economic importance to the development of coastal regions. Particularly marine sectors such as aquaculture, marine robotics, and marine renewable energy which fulfil global needs in food safety and security, enable monitoring and exploration in harsh and remote conditions, and globally growing energy needs were recognized as catalysts to achieve sustainable development. Marine start-ups and small and medium-sized enterprises (SME) were identified as potential drivers in emerging marine sectors. However, they require support mechanisms tailored to their needs as they are competing for the same business and financial support as land-based SMEs, yet the research and development infrastructure is more difficult to access.

ProtoAtlantic, an Interreg Atlantic Area funded project, provided marine-specific support mechanisms to marine start-ups and SMEs in emerging sectors, including business support through the accelerator and mentorship programs, enabling companies to fast track their product development through access to prototyping and testing facilities in all partner regions. The Interreg Atlantic Area encompasses partner regions in France, Ireland, Portugal, Scotland, and Spain. The consortium partners consist of Technopôle Brest Iroise (Brest, France), University College Cork – UCC (Cork, Ireland), County Council Cork (Cork,

Ireland), INESC TEC (Porto, Portugal), the European Marine Energy Centre – EMEC (Orkney, Scotland), EMERGE (Canary Islands, Spain), and the lead partner, Innovalia Association (Canary Islands, Spain). The strategic collaboration between the partners provided marine start-ups access to testing facilities in the Atlantic Ocean. The extreme living laboratories provided by EMEC, the LiR National Ocean Testing Facilities at UCC’s Centre of Marine and Renewable Energy (MaREI centre), and INESC TEC promise harsh real-life conditions which test the suitability of marine technologies to the limit thereby providing start-ups and SMEs with an extra layer of confidence in developing their technologies. This cross-regional collaboration puts the ProtoAtlantic program in a unique position, as it is the first of its kind to dedicate marine-specific support to marine start-ups and SMEs which have benefited from the opportunities that ProtoAtlantic has provided.

ProtoAtlantic developed a holistic model for the prototyping and exploitation of innovative ideas in emerging maritime sectors. After the identification of ideas from the research community, start-ups, and SMEs with product innovation capacity in the maritime sector, an acceleration program with a normed and structured process was implemented, thus creating a unique ecosystem in the Atlantic that is addressing a co-creation paradigm with the local European start-ups communities and all the stakeholders.

Keywords— blue growth, sustainable blue economy, regional economic development sustainable development, acceleration program, prototyping

I. INTRODUCTION

Attending to what the European Union exposed in the “Blue Growth – Opportunities for marine and maritime sustainable growth” document [1] the sea and the coast are economy drivers, and ports and coastal communities have traditionally been centers for new ideas and innovation. In addition, three new factors have now come to play: fast technological progress, an increasing awareness that land and freshwater are finite resources, and the need to improve energy efficiency of ships. In this context, the Atlantic area faces common challenges in a wide area comprising coastline from Ireland to the Canary Islands. That is why these Atlantic area regions have included a marine approach related to innovation and growth in their RIS3. Indeed, growth-generating initiatives will inevitably be on a local or regional scale, and each of Europe's sea-basins presents different challenges and opportunities, requiring tailor-made approaches.

Against the backdrop of this, five coastal regions based in Las Palmas (Spain), Cork (Ireland), Brest (France), Porto (Portugal) and Orkney (Scotland) collaborated on the ProtoAtlantic project from October 2017 until October 2021. This Interreg Atlantic Area funded project focused on the development of marine sectors particularly in the emerging sectors of marine renewable energy, marine robotics, and marine biotechnology.

The main objective of the project was to develop a whole model for the prototyping and exploitation of innovative ideas in the maritime sector. Starting with the identification of start-ups and product innovation capacity from the European Union in the maritime sector willing to address emerging markets in a co-creation paradigm with the local start-up communities. The action was based on existing co-working spaces specializing in the marine sector and replicating success stories in European countries from the Atlantic area. For that purpose, acceleration programs were implemented across the participating partner regions and beyond, starting from ideation to market access where a normed and structured process was used to manage product innovation for emerging and mature markets. The acceleration programs were developed to attract the most innovative ideas in the maritime sector coming from West Africa and Europe, creating a unique ecosystem in the Atlantic where the creation and development of ideas melt with a methodology that covers topics from business model to market validation, including technology testing phases in emerging maritime sectors. This circle was completed with the prototype and launch to market of the most innovative and feasible ideas. The network of prototyping and co-working centres in the marine-maritime field allowed the participating start-ups and marine entrepreneurs to find the most suitable place to build and test their prototypes, and to identify the best places for the companies to establish and launch their business.

The novelty of this project was the approach and the methodology to validate the innovative ideas before the market introduction, aiming to create a new ecosystem where the product development cycle is closed, counting on the expertise and the strengths of all the partners. Entrepreneurs were provided with acceleration programs in which they were able to

validate their products and technologies. Access to product innovation is often challenged by limited prototyping capabilities in emerging and mature markets. The situation is general to all European countries, especially in the South, where countries are proficient in basic R&D but lack the ability to convert this research into marketable products. Innovation requires an understanding of the local market mindset, aspiration, specificities, as well as specific requirements of product development. Developing a framework where a product innovation capacity is combined with market knowledge and access can yield a new value creation paradigm benefitting start-ups and potential investors, and thus, may enable the creation of new start-ups. Implementing such a framework has the potential to create a shift in value creation between the North and the South of Europe and may lead to a new prosperity model in the European Atlantic Area. In these regions, the marine sector is prominent within the traditional markets such as the North Sea for the offshore industry, and promising with the new EC strategies, however lacking the traction schemes to provide a virtuous circle.

The project supported several start-ups and SMEs with product innovation capacity in maritime sectors at different levels of product development, and allowed the project partners to develop accredited services for prototyping, product design and industrial setup increasing their activity and enriching their networks and capabilities through the cooperation framework. With this project, partners expected to validate a methodology that will endure over time. In fact, the developed framework of ideation and collaboration between several actors focused on the maritime sector satisfies the growing demand in the maritime sector.

This paper briefly describes the methodology used in all three phases of the project, the fundamentals behind it, and the results obtained.

II. METHODS

The consortium was organized around 8 regions in 6 different countries (Spain, Ireland, Portugal, France, United Kingdom and Morocco) and divided into four kinds of partners working on four general themes. Partners were divided into public authorities, business support agencies, University/research/technology centres and prototyping facilities. The topics covered by the consortium were policy making, acceleration activities, bringing research to market and prototyping. Each partner provided support in the topics in which they have an expertise, enriching the partnership and the consortium with a high level of expertise.

The leading partner, INNOVALIA Association brought technology development expertise and a team of experts specializing in business plan development and the introduction into the market of new products. EMERGE added value with its expertise in the marine sector, its co-working space and its knowledge on 3D printing and prototyping. University College of Cork (UCC) provided expertise in business management and mentorship tailored to the needs of marine start-ups. UCC, through the LiR NOTF provided start-ups with access to custom designed test facilities for laboratory testing of offshore wind,

wave and tidal energy devices for wave, tidal and offshore wind energy development. LiR NOTF also provided support for testing floating structures, offshore structures, and coastal engineering. Technopôle Brest Iroise (TBI) developed the ProtoAtlantic methodology and acceleration activities in its region. European Marine Energy Centre (EMEC) is the first and only centre of its kind in the world to provide developers of both wave and tidal energy converters with purpose-built, accredited open-sea testing facilities. Institute for Systems and Computer Engineering (INESC TEC) brought a high capacity in prototyping and the most advanced technologies. INESC TEC conducts R&D activities in autonomous robotic systems, mobile robotics and mobile multi robot systems for inspection, monitoring and mapping, with applications in security, power systems, environment, aquaculture, oceanography, marine biology, resource extraction, among other sectors. These activities are supported by the research in perception, navigation, control, localization, coordination, and automatic data collection and processing. Cork County Council (CCC) provided precious information and support about policy making and communication activities. Brest Municipality and LPAMAR (la Concejalía de Ciudad de Mar del Excmo. Ayuntamiento de Las Palmas de Gran Canaria) and Marine South East (MSE) supported the policy making round tables and the dissemination activities.

The project was divided in 3 stages: (A) policy overview, (B) acceleration and business support and (C) prototyping. The actions and activities developed included regional workshops, consultative round tables on Policy Development, implementation of acceleration programs comprising a boot camp, a Mentorship Program, and a Demo Day, and finally prototyping and testing (tank and marine).

Each partner has led actions and activities in the realm of their expertise, at the same time collaborating and learning from the other partners. In this way, INESC TEC, EMEC and UCC have focused on the development of the strategy for prototyping. UCC, EMERGE and TBI coordinated in delivering the acceleration program and INNOVALIA, Las Palmas de Gran Canaria City Council, UCC, CCC enabled the evaluation of public policies, the coordination of European projects and technological advice to companies. CCC has provided a public approach to designing the strategy.

A. Policy Overview

In the first stage, policy overview, the partners organized consultative round tables on policy development targeting regional stakeholders in the marine space to investigate the enabling factors that nurture blue growth regionally, thereby gaining an understanding of the stakeholders' experiences within their regional economic development landscapes [2]. These regional consultative workshops followed a workshop template that was designed with the goal to encourage active participation between the stakeholders.

The workshop design followed two techniques. Firstly, the PESTLE technique, which is a strategic easy-to-use tool that helps identify external risks [3], was used. This technique provided a snapshot of the current enablers and constraints experienced in each region focusing particularly on the political,

economic and business related, social, technological, legal, and environmental perspectives as experienced by the stakeholders [4, 5]. Secondly, a SWOT analysis was undertaken. The SWOT technique is a commonly used strategic planning tool that helps decision-makers identify potential ways of increasing efficiency and meeting targets [6]. This technique allows for the evaluation of strategies. The technique is used to determine potential strengths, weaknesses, opportunities, and threats of potential strategies.

B. Acceleration and business support

The second stage, acceleration and business support, included 1) a review of the current state of the art in commercially led enterprise development initiatives in the marine space; 2) a review on approaches to investment in Blue Growth in the private sector; and 3) a roadmap for a Blue Growth accelerator program for the region.

The Accelerator Program comprised three phases: Bootcamp, Mentoring and Demo Day. Boot Camp included 12 intensive workshops which used the same methodology, 'Learning by doing', provided by a pool of specialized experts in the maritime sector. The main objective and output of the boot camp was the elaboration of a business plan which was sent to the mentor assigned to the entrepreneurs/start-ups for phase two of the accelerator program. The Boot Camp was composed of two different phases; the first one (2 topics) celebrated simultaneously in Cork, Porto, Brest and The Canaries. The second phase (5 topics) took place in The Canaries. Experts provided specific training to entrepreneurs on how to successfully reach the market from the know-how and capacities/ideas of the entrepreneurs and their teams.

Mentorship included an intense mentorship program of twelve weeks with the support of the pool of mentors in the maritime and marine industry, in which companies and entrepreneurs had a one-to-one meeting with their assigned mentor on a regular basis.

The objectives of this process were to refine the business model; validate the market/selection of the potential clients and prepare for the investment process. Mentors were senior entrepreneurs, consultants of professional companies with experience in the marine/maritime sector, and professionals experienced in the development of business plans for technological companies. Mentors are usually experienced entrepreneurs who link start-ups to the ecosystem through their knowledge and familiarity with the different aspects of growing a business.

Finally, Demo day consisted of a special event to be held in the Canary Islands, unfortunately due to Covid-19 related travel restrictions this was transformed into a virtual event. Entrepreneurs had the opportunity to meet and connect with relevant business actors that may assist them to find sustainable paths for their start-ups. The Demo day provided start-ups and SMEs an opportunity to pitch their technologies to investors in front of a live audience.

C. Prototype Development and Testing

To continue the success of the accelerator program the ProtoAtlantic consortium supported marine entrepreneurs and

start-ups through the third stage of the project: Marine Product and Technology Development and Prototype Testing. This was achieved by providing support on marine product and technology development as well as by providing access to prototype testing infrastructure across the Atlantic area. A call for applications was opened for start-ups that wanted to test at world-renown testing facilities such as EMEC, Lir-NOTF – Ireland’s National Ocean Test Facility, and INESC TEC. An evaluation panel composed by two or three members from each partner ranked the applications based on a scoring grid previously established taking in account several determining factors such as Available funding, TRL acceleration potential, Suitability, Innovation/USP and Commitment to the program. The 10 start-ups with the highest scores were chosen and granted access to the testing facilities as well as technical support and consultancy.

III. RESULTS

ProtoAtlantic facilitated a number of hands-on events and workshops specifically targeting the collaboration of the triple helix, i.e. academia and research, government and economic development agencies, and industry representatives in and across the region. Building these relationships has enabled policy and economic development consultations in the coastal regions resulting in animated discussions on blue growth and a sustainable pathway forward. The consortium organized 4 regional round tables with stakeholders for supporting policies and capitalization purposes, and 8 events for dissemination and community building. 218 stakeholders across the Atlantic area participated in the ProtoAtlantic blue growth policy round tables where marine-specific cluster creation was identified as a key priority to ensure the nurturing of marine entrepreneurship. Each workshop produced a workshop report which formed the basis of the findings, more details to the policy recommendations can be found at ProtoAtlantic Blue Growth Policy Recommendations Roadmap for Marine Policies [7]. Across the regions, 36 policymakers (16%), 108 industry representatives (50%), and 74 stakeholders from research, university, and academia (34%) engaged in the five workshops.

ProtoAtlantic has successfully delivered the first blue growth accelerator program geared specifically towards marine start-ups in the Atlantic Area. The ProtoAtlantic accelerator program has proven to be a viable way forward to foster innovation and entrepreneurship in marine sectors across the Atlantic Area which has attracted the attention of public and private investment. ProtoAtlantic serves as proof of concept that such programs accelerate the progress of marine start-ups. Proof of concept available at: ProtoAtlantic Blue Growth Accelerator Programme: Investment Opportunities and Roadmap [8].

A total of 130 start-ups participated on the four accelerator programs organized by the partners, 85 of them continued to the mentoring phase receiving mentorship on an individual topic and ten were supported on prototyping and testing. The demo day was open to these start-ups as well as to new ones that applied, with a total of 10 start-ups from 4 countries participating in the Demo Day they were given access to 9 investors from across the Atlantic area.

The prototyping phase was open to nine start-ups; five from marine renewables, one from aquaculture and three from robotics. All of them received support from at least one of the partners through testing, prototyping or consultancy, three start-ups were supported by two or more partners and one of these received support from all three partners (Table 1).

TABLE I. STARTUPS AND SMES WHICH PARTICIPATED IN THE PROTOATLANTIC PROTOTYPING PHASE

Company	Country	Area	Prototype	Partner		
				EMEC	INESCTEC	UCC
A. Silva Matos	Portugal	Marine Robotics	Autonomous Lander		x	
Exceedence	Ireland	Marine Renewables	Thermoplastic Spring	x	x	X
Fazzini Meccanica	Italy	Marine Renewables	Wave Energy Converter			x
Impact 9	Ireland	Aquaculture	Auto Submerging Fish-cage		x	x
Oceomic	Spain	Marine Robotics	Self-deploying Water Sampler	x	x	
Pure Marine	Ireland	Marine Renewables	Wave Energy Converter			x
SWEL	United Kingdom	Marine Renewables	Wave Energy Converter			x
SubSea Mechatronics	Spain	Marine Robotics	Remotely Operated Vehicle		x	
TFI Marine	Ireland	Marine Renewables	Thermoplastic Spring			x

ProtoAtlantic’s efforts have resulted in an engagement of over 6600 stakeholders across the Atlantic area over the duration of the project, indicating that there is a keen interest in creating a vibrant innovation ecosystem driven through a variety of stakeholders. ProtoAtlantic created a vibrant ecosystem and community with stakeholders in and outside the Atlantic Area to engage the marine startup community, academia and research, policymakers, industry partners and investors. The strategic cross-regional collaboration between the ProtoAtlantic partners has provided support mechanisms for startups, SMEs, and stakeholders in the innovation ecosystem across and outside of the Atlantic area [9,10].

IV. CONCLUSIONS

The Interreg Atlantic Area is rich in marine resources and provides a unique opportunity to develop sustainable growth in the coastal regions geographically and in terms of management of the marine resources. All the regions included in the ProtoAtlantic project present a common interest in innovation and prototyping. Every partner has faced innovation in a different way, but all these approaches are complementary and lead to an innovation ecosystem in the marine sector, taking advantage of the strengths of each region. The cooperation allowed the creation of new companies and spin-offs with innovative ideas and the prototyping of new products that will create jobs and economic growth and will improve efficiency in the Atlantic Area.

The acceleration programs for start-ups and projects are based in the development of infrastructures, experts mentoring and funding. A specific method to validate entrepreneurship projects related to blue growth does not exist, highlighting a great gap between the research and technological development projects and the start-ups community in emerging marine sectors

addressing blue growth strategies. This project validated an international methodology to offer to the scientific community a tool to develop start-ups and spin-offs in the maritime field. This will allow training to high capacity teams in order for them to develop projects and enable start-ups to get scalable, and ready to scale through a viable business model, sustainable and with a high social impact.

ProtoAtlantic placed the Atlantic region as a reference in maritime entrepreneurship by 1) validating a methodology to develop maritime start-ups in the Atlantic Region 2) focussing the “entrance door” to the maritime prototyping and start-ups development for the associated countries in the Atlantic Region and 3) enriching the prototyping labs in the Atlantic Region with new marketable ideas.

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