The Portuguese Offshore Energy SWOT Analysis

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The Portuguese Offshore Energy SWOT Analysis

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Abstract. Renewable energy has gained importance in recent years because of its cooperation in ecosystems, welfare and the circular economy. The new business model comprises new values for organizational sustainability. Moreover, renewable energy such as offshore energy is associated with innovation systems, knowledge and collaboration between organizations. The participation of the offshore energy sector has increased in the Portuguese renewable energy supply. It is known that renewable offshore energy suppliers will cover economic necessities. One of the strategies was to set up a new business model based on supplier organization networking for the construction of an offshore wind farm. This will contribute positively to lower fuel dependency, fewer imports, control of energy prices and market regulation in terms of supply/demand. The methodology used was an electronic questionnaire applied to emergent offshore energy cluster stakeholders. The SWOT analysis of the offshore energy sector contributes to an understanding of the offshore energy sector in Portugal and reveals the business model with which the stakeholders are faced. Moreover, it draws up a business strategy oriented towards competitiveness and cooperation with other energy sectors.

1. Introduction

The RES (renewable energy sector) and in particular the offshore energy sector in Europe and in the Portuguese economy has taken on new importance due to the new European strategy for the energy sector.

The RES has particular importance due to the interest in its implementation and discussion about its links to the pentagonal problem discussed by [1] showed that the RES is responsible for a new concept of energy production. As such, the offshore energy sector and its clustering have begun to build a space in economic development and create a positive flux in the economy. This implies a new assumption that the business model adopted by organizations should change towards greater collaboration and competitiveness with other energy sectors. This article shows the importance of the offshore energy sector in Portugal, and presents a new market strategy based on SWOT cluster analysis.

The article is divided into three main parts. Firstly, it explains the Portuguese maritime cluster, secondly the offshore energy cluster and thirdly, it demonstrates the business model for the offshore energy cluster based on stakeholder opinions. The management model and its applicability to the offshore energy sector can be achieved if there is also vertical cooperation in the value chain, like the participation of other institutions towards a *profit* network. Innovation, investment, human skills and production need to be linked towards a better decision-making by managers. This networking is the basis for a business model with competitiveness and cooperation at regional, national or European levels.

2. The case of the Portuguese Maritime Cluster

[2:21-23] defines the maritime economy as: "all the sectorial and cross-sectorial economic activities related to the ocean, sea, and coast. This includes the closest direct and indirect supporting activities

necessary for the functioning of these economic sectors, which can be located anywhere, including in landlocked countries".

The concept of ocean economy presented by [3], cited in [2], refers to "economic activities that take place in the ocean, receive outputs from the ocean, and provide goods and services to the ocean". The marine economy is related to emerging ocean industries and established ocean-based industries. Maritime sectors comprise activities linked to the sea; the link between activities and the sea may be explained by the use of marine resources, marine areas or by the vicinity of these areas. These linkages between sectors can follow the cluster concept when they have some direct or indirect economic flux ([4];[5]). According to [6], maritime clusters can derive benefit from knowledge sharing and knowledge transfer from research, encouraging joint innovation exercises (e.g. product development), and ensuring availability of know-how (e.g.joint training programmes) or innovative organisation methods covering a group of enterprises (e.g. common procurement or distribution).

The marine cluster project was launched by the Marche region in October 2004 with the goal of establishing a new, technically specialised yacht and shipbuilding system in Ancona. the initiative promoted a system of goods and services related to navigation, namely shipbuilding, pleasure craft, accessories and infrastructures for tourism and commerce and was horizontally connected to the other main regional sectors with the aim of further integrating the different clusters [7]. By definition, all maritime cluster organizations capture more than one maritime sector. Maritime cluster organizations represent almost every traditional maritime sector; although in practice this does not (yet) always seem the case– except the sectors that only answer a broader definition of maritime sectors, such as the Navy and coastguard, inland navigation and maritime works.

The fisheries and coastal (and marine) tourism and recreation sectors are sometimes represented by the national cluster organization, although this is less frequent than the traditional maritime sectors [8]. [9] argue that studies on a maritime cluster or other clusters are mainly concerned with the relationships between ports, the shipping industry, or services from the shipbuilding industry.

[10] argue that Michel Porter´s theories' can be applied to the marine sector, as the Norwegian maritime cluster presents the majority of characteristics that one can find in large industrial groups, including strong inter-sectoral linkages, economic diversity and competitive rivalry. [7] presents maritime clusters as relationships between competences, entrepreneurship and experiences, both inter- and intra-industry. This means that the marine cluster is related to organizations and services which comprise intra- and inter-sector relationships.

In particular, [7] identifies those sectors which have more impact (direct or indirect) on the marine economy. From [7] point of view, the engines and propulsion systems, tourism, services and manufacturing constitute indirect impacts on the marine cluster with the other services being the direct impact. [6] identifies the relationship between different levels of clusters (regions, Member State, European Union, international organization); these relationships are based on similar sectors and activities, such as transport, resources, public sector, other services, research and leisure and tourism. The dynamic between them comes from the interaction between their activities from different clusters. The positive aspect is complementarity and cooperation of goods and services between all levels of clusters.

Maritime cluster organizations exist at different geographical levels, focusing on international and/or European, national, regional (incl. cross-border) or local levels. Policy (initiatives) and actions are consequently translated to European national and regional levels, although not in a uniform manner [8]. The "*Cluster do Mar Português / Portuguese Maritime Cluster*",[1] is promoted by FórumOceano – Associação da Economia do Mar, and was recognized as a Competitiveness Cluster Strategy by the Ministers of Economy, Maritime, Planning and Infrastructures, and National Defence. Fórum Oceano is the merger by incorporation of two Portuguese associations, Oceano XXI – Association for the Knowledge and Economy of the Sea (established in 2009) and AFEM – Association Business Forum of the Sea Economy (established in 2010), which occurred in July 2015.

[1] http://www.forumoceano.pt

VISION– Maritime activities are dynamic and competitive segments of the economy, enhancing the sea and its resources, generating value, promoting high-value jobs, and contributing to strengthening Portugal's position in the global economy. *MISSION*–To strength the dynamics of strategic cooperation between players; to promote the competitiveness of the main value chains that utilize the sea and marine resources as the central elements of its activity; to contribute, in a sustainable way, to economic growth and the growth of exports and employment; to increase the maritime economy's importance to the national economy.

The association has more than 100 members connected to many sectors of the sea economy, including *traditional* ones, such as: seafood conservation, processing and commercialization; shipbuilding, repair and maintenance; nautical activities and marine tourism; maritime construction; fisheries and aquaculture; ports, transport and logistics, *or complementary* areas, like: maritime culture; maritime defense and security; services; or *emerging* ones, such as: marine bio resources and biotechnology; marine renewable energy; and offshore and oil &gas. The Portuguese sea cluster has three main objectives: to increase the value added and the consolidated business from the sectors which comprise the cluster; to promote emergent activities and to increase international market networks and investments. These objectives are based on entrepreneurship, innovation and modernization, sea technologies and knowledge, internationalization and strategic information.

3- The offshore energy sector in Portugal

Wind and wave offshore energy are the future of energy supply in Portugal. The key challenge of offshore suppliers is to compete with other fossil energy production. Offshore energy is directly related to expert employment, technology and direct investment in electric equipment, dry docks, maritime transport support, engineering and consultancy studies and expert knowledge.

There are a few aspects with which this sector deals in a negative way – the spatial needs for energy sectors –which means that the energy and economic infrastructures do not meet regional needs. According to [11], exploration, fixed installation, and decommissioning are the fragile points with which countries need to deal concerning environmental and use impacts. In order to achieve the target proposed by the European Union in the 2020 programme, every country has to design different strategies to accomplish the general goal. The development of renewable energy has an outstanding effect on sustainable economic growth, for the harmonious coexistence of humans and the environment as well as for sustainable development. Renewable energy usually refers to that energy that does not pollute the environment and could be recycled in nature [12].

Offshore renewable energy faces similar changes in most countries, such as the location of offshore wind farms, port facilities, underwater cables, operation and maintenance and decommissioning projects. On the other hand, the environmental impact and spatial competition between energy and other maritime activities should be analyzed. The environmental impacts are normally related to noise, infrastructure, and decommissioning projects, this means that the impact on sea species and birds, as well as, oil spill should be taken in account by stakeholders. Moreover, benefits from energy sector on economy (spatial synergies from wave-tidal-wind; certainty and consistency (planning certainly from stakeholders towards investments in this sector); grid development and grid interconnection within other sectors; cross border cooperation in knowledge, skills, development and experience towards a market corridors for regional energy market integration; data collection from energy sector) should be analysed. The objective is to reduce the cost of installation for each type of energy and guarantee a better performance, in technology innovation and learning by doing must be translated into a comprehensive cost-reduction pathway if wave and tidal energy technologies are to achieve cost competitiveness on commercial markets [13].

From the following tables, it is possible to conclude about the use of RES in Europe and Portugal. Few factors can be pointed out to explain the data, the demand, the green economy, and the ecosystems. The data shows that the European market has increased its consumption and primary energy uses. Clearly, there is a possibility to change the market energy supply, whereas the use of RES will be in majority of energy. This feature also explains why a different model should be adopted by

organizations. The market is changing, as well as attitudes about the environment, green economy, circular economy and welfare.

Table 1–EU Renewable Gross Electricity Production (wind and tidal, wave and ocean), 2018, 1990-2013 (GWH)

	1990	**1995**	**2000**	**2005**	**2011**	**2012**	**2013**	**Growth rate (1990/2013)**
Wind	778	4068	22254	70455	179669	205980	235012	301.1%
Tide, wave and ocean	503	507	507	481	478	462	420	-16.5%

Source: [14]

Table 2–Share of Renewable Sources in Gross Final Consumption of Energy (%)

	2011	**2012**	**2013**	**TARGET 2020**
EU-28	12.9	14.3	15.0	20
Portugal	24.7	25.0	25.7	31

Source: [14]

Table 3–Renewable Sources as a Percentage of Total Primary Energy Supply

	1970	**1990**	**2010**	**2014**
EU-28	21.6%	19.5%	23.2%	24.6%
Portugal	----	4.3%	9.8%	-----
OECD	-----	5.9%	7.8%	9.2%

Source: [2]

Moreover, over the course of recent years, Portugal has created a series of financial and fiscal measures to support investment in renewable energy. These measures have been boosted with the creation of differentiated tariffs for electricity produced in renewable plants, feed-in tariffs (FIT), according to the degree of maturity of the various technologies available in the national market.

These measures have helped to achieve the overall objectives of the national energy policy. Renewable energy has become increasingly important and visible in the national strategy. The latest National Energy Strategy (NES 2020)[2] continues to attribute a pivotal role to renewable energy and the targets that have been delineated for this sector, with a very significant impact on the Portuguese economy.NES 2020 incorporates the objectives of the energy policy and seeks to maintain Portugal at the fore front of the energy revolution with regard to the use of renewable energy (increase of installed hydro and wind energy capacity). Wave energy will be very important in the future: specific instruments have been envisaged to promote it and to develop the necessary technologies. Amongst

[2]Approved by Government Resolution No. 29/2010, of 15 April

these measures, it is especially important to note the implementation of the pilot zone created by Decree-Law No. 5/2008 to test technologies that harness wave energy.

4- Uploading a Portuguese Offshore Energy SWOT analysis

The methodology used to discuss a business model for Portuguese offshore energy was a SWOT analysis. An electronic questionnaire was applied to 14 organizations which belong to the Portuguese offshore energy sector (NGO, government, research centers, and suppliers). It tested opinions about the future of the offshore energy cluster in Portugal and how future organisations are involved in the cluster. The questionnaire was sent to suppliers, government entities and others which can influence positively the potential energy cluster in Portugal. The total of inquires was 14 organisations, divided by private organisations (60%), universities (13%), research centres, public organisations, the government and NGOs (7%). Some results are pointed out to discuss the cluster analysis, such as the relationship within the sectors: The results showed that 36% of the companies were independent or included in an international group; 21% were included in a national group and just 7% were considered as "other", such as research centres and universities; according to the same questionnaire, the cooperation and collaboration showed that services are mainly inside the sector, main services and goods supply from the sector, showed that the interviewees are mainly supplied by EU organisations, the organisations cooperated with other organisations (75%), technological cooperation, the interviewees stated that with organisations, technological cooperation is in process production and in new products, and in financial terms all organizations agreed that Legislation, policies, financial incentives and taxation are part of this emergent cluster, namely Portugal 2020, Interface Program and Blue Fund.

The study comprises the study of the offshore energy cluster in Portugal [15].The SWOT analysis made on this cluster contributes to an understanding of the factors which influence the business model and the principal features to exploit in the market in the near future.

SWOT analysis is the beginning of a business strategy in any market; therefore, in order to survive, any organization needs to accept and evaluate products, to be competitive. In this outlook it is important to analyse the market position in comparison with other organizations with the same market segmentation. Moreover, SWOT analysis completes how clusters deal with their strengths, weaknesses, opportunities, and threats. [16] define strategic planning as an extended tool for regional development and territorial structure. Consequently, SWOT analysis is an instrument which comprises internal and external factors associated with favourable and unfavourable outcomes [17]. In this point of view, there are four main fields in SWOT analysis:"Strengths": internal positive characteristics that the organization can exploit to achieve its goals;"Weaknesses": internal characteristics that may inhibit the organization from achieving its goals; "Threats": aspects of the external environment that may prevent the organization from achieving its strategic goals; and "Opportunities", which are described as the characteristics of the external environment that have the potential to help the organization to achieve or exceed its strategic goals [18]. SWOT analysis is a methodology for setting up a business plan based on hierarchical, quantitative and consistent objectives, and with real goals [19]. SWOT analysis presents some limitations, such as an inadequate definition or lack of prioritization of factors; over-subjectivity in the generation of factors: compiler bias [20].

[16], [21], [22] and [23], point out the importance of using SWOT analysis to face problems in a renewable energy industry, namely, suitable strategies that could overcome such problems, and that it also summarizes key issues of the business environment, including the organization's capability for strategy [18]. Not surprisingly, clusters can be related to SWOT analysis. Regional planning and regional strategy are both concepts which comprise better cluster performance. SWOT analysis confirms the plans for better utility of resources.

The general balance of both from internal or external factors quickly and economically exposed so that an organization can work via a business plan towards facing problems which emerge in its relationship with the environment. [16] argues that is possible to present the most important points to the SWOT analysis renewable wind energy sector:

1- Strengths: Domestic source; new business opportunity; resources are environmentally friendly; wind energy is renewed on a daily basis; it provides a central control for each government; the supply of sources depends on the needs; well-planned transport system can reduce costs in the supply chain; contribution to long-term energy demand; contribution to energy diversification and energy competitiveness; 2-Weaknesses: Energy share still small in the world market, although this share will increase but it will not surpass fossil fuel till 2030. Governments are required to promote this type of energy otherwise it will fall behind fossil fuel. The initial investment is high and the production does not occur at a stable level; 3 - Opportunities: Development of new technologies; market size will increase with increasing effectiveness; SMEs technologies; 4 - Threats: Few grants; tax exemptions need to be provided by governments, otherwise the prices will be higher than fuel energy; some initial setup costs are high, with negative effects on market entry.

The SWOT analysis presented by [24] for central Europe (Austria, Czech Republic, Hungary, Slovakia, Italy, Poland) on energy and the environment presents the following strengths: better energy promotion and environment industry; transfer of knowledge and know-how; internationalization of clusters, sharing research and testing facilities, and developing new and better services to clustered firms; ability to innovate, common projects with real business value; generates market for others products; sharing best practices; influence of regional development policy; boosting interests of potential members due to access to European Union funding. The threats are :economic crisis and lack of sources of financing; decrease in clusters member activity; cultural differences; lack of trust among clusters; differences among the meta cluster members (national/regional, priority differences); the meta clusters can become a platform without any real content.

From the Portuguese perspective the first study to present the swot analysis about the energy sector in Portugal was [25]. [25] developed a SWOT energy sector analysis in Portugal, referring to the characteristics of the Portuguese energy system and the internal features of companies presently operating in the market and project investments.

The cluster SWOT analysis made from the questionnaire enabled conclusions about strengths, weakness, opportunities and threats that the cluster will face in the near future in Portugal. The emergent Portuguese offshore energy cluster has just started to take the first steps towards a competitive European energy offshore cluster. Nevertheless, from the analysis, it is possible to come to conclusions about its performance and capacity in the market and the behaviour in the economy.

The SWOT analysis leads to an innovation sector with a high level of research and development activities, it based on expertise knowledge and is environment friendly. The strengths will bring the sector into high competiveness within the Portuguese energy sector in terms of innovation and performance. However, the sector faces points of weakness related to its strategic planning to set up the links between organisations. The inexistence of a road map to deliver a strategy and regulation within the sector, the lack of communication between the stakeholders, and high level of investment are other negative points which the sector will face when in the market.

The SWOT analysis also refers to the opportunity for new investments and R&D activities, such as economies of scale and emerging markets (opportunities).Additionally, the sector faces threats related to its capacity to compete with other energy sources, and the direct costs related to its production, as well as funding levels and priorities. The SWOT analysis demonstrates a sector with a high capacity for expert employment, development of technologies and R&D activities. However, it is an emergent sector in the Portuguese economy and will face competitiveness with other energy sources, cooperation between suppliers and a high level of investment.

The SWOT analysis showed also that this sector has the capacity to be a cluster if the stakeholders and others commit to cooperating in the long run in technology, expertise and knowledge. Moreover, an internationalisation of energy production is also expected in this sector which will lead to a better relationship with other European partners.

The SWOT analysis allowed a description of stakeholders 'expectations about the potential cluster itself and its relationship within the energy market. Therefore, the capacity for staying in the market depends on its capacity to promote renewable energy with lower production costs and short-term

return on investment. Also, human resources specialization, knowledge transfer and innovation constitute important decision variables for competitiveness in the sector.

To conclude, the offshore business model from the SWOT analysis is based on the potential in human resources, knowledge transfer and investment. However, vertical and horizontal decisions need to be consistent with a competitive sector based on key initiatives, such as standardization and certification, minimizing the environmental impact of offshore wind farms, grid integration, and offshore development based on collaboration and cooperation. On the other hand, the business model is also linked with an ecosystem, welfare and the green economy.

Table 4–Offshore Energy Cluster in Portugal: SWOT Analysis

	Most positive points (>50% of responses)	Less positive points (<50% of responses)		Most positive points (>50% of responses)	Less positive points (<50% of responses)
STRENGTHS	Innovation; extensive R&D development activities; environmentally friendly and expert knowledge	public interest; efficient government support, return on investment, and geographic diversification; network investments and human resources; good natural resources	WEAKNESSES	lack of strategic plan;	No road map; high level of investment and communication between stakeholders; security, environmentally unfriendly, data challenges;
OPPORTUNITIES	R&D activities; Investment opportunities;	Economies of scale; emerging market;	THREATS	Competition with other energy sources; price of energy from offshore energy production; funding levels and priorities	Environmental regulations; environmental risks.

Source: Pego, A. (2019:203)

5- Conclusions

It is clearly understandable that the offshore energy sector is an emergent sector in Portugal. This emergent sector (cluster) is a concern with an innovative cluster based on competitiveness, cooperation, and collaboration with other sectors. Apart from this, the offshore energy sector comprises a new business model based on environmentally friendly technology and welfare, which will draw in a new production model based on demand (*INOVGRIDEDP*).

This SWOT analysis will contribute to positive benefits in the sector related to the use of innovation and technology, energy potential, green technology potential, investment in the sector and knowledge transfer; however, according to the research questionnaire, there is a lack of connection between the stakeholders and the government, as well as deficient regulatory laws and lack of a roadmap. Therefore, the business strategy begins with an attitude towards more cooperation within the sector. The interest in the future is to draw a model where it can be performed the relationship with

other sectors in the market, the renewable road map and the strategy for more cooperation and collaboration within the sector.

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