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Business Model for a Circular Economy based on Portuguese Offshore energy cluster

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Abstract. Recent studies on renewable energy and its links to the circular economy point to the importance of creating a business model that supports this relationship. For example, the importance of the circular economy has transformed the supply chain in industries in recent years and has stimulated new consumer needs and market supply in the last decade. Indeed, renewable energy is linked to the circular economy and its ability to promote positive externalities in the market. The development of this relationship gained importance when concepts such as ecosystems, welfare through recycling, blue economy and sustainable development were analyzed in the economy. This relationship is also linked to value creation in the economy and market performance. Therefore, the business model that emerged from this link was based on a new economic approach related to the supply capacity of the industry. In addition to this industrial challenge, renewable energy is one of the vectors of the circular economy and includes positive externalities for the economy, namely climate friendliness, welfare and industrial performance. The purpose of this paper is to show the relationship between renewable energy and circular economy and the industrial impacts in the economy. In order to analyze the renewable energy business model and its applicability to the circular economy in Portugal, the paper presents a qualitative methodology based on the analysis of Porter Diamond Model and SWOT. The results showed that there is a readiness to develop a business model for the environmental services sector of offshore energy cluster actors, based on the new European Policy for environmental and energy policies (2021-2027). The conclusion also showed that the offshore energy cluster-based environmental services business model in Portugal is linked to innovation ecosystems, a network platform, green production and public-private partnerships. A positive impact on the value chain is also expected from the use of renewable energy in the industry value chain. The study will contribute to European countries following this business model towards competitive and cooperative sectors.

Keywords. circular economy, cluster, renewable energy, business model

1- Introduction

Nowadays, the use of green sectors, such as offshore energy, faces the challenge of improving specialization and competitiveness with other sectors. The cost of energy has become a major issue in developing countries and its impact on the economy has become one of the most important vectors for European Energy Policy (2021-2027). In addition, renewable offshore energy is seen as a way to increase non-fossil consumption and as an option to optimize the offshore sector. This means that the increase of offshore energy expenditure; consequently, the

use of offshore energy is an option to change the attitude towards the use of natural resources and reduce pollution. Offshore energy is considered as a great advantage for the economy and a starting point for the use of renewable energy [1]. Another fact refers to the possibility that this sector supports the production capacity in the circular economy. Indeed, offshore renewable energy and the circular economy are associated with a positive impact on the economy through the use of a green value chain, but also the capacity of organizations improve their participation in the environment, smart production and ecosystems. The circular economy is considered as a business model based on the ability to create value in the economy through the value chain [2]. The use of offshore energy sector includes a number of benefits such as green production, eco-innovation, ecosystems and low-carbon spending. The aim of this study is to investigate the circular economy business model based on the offshore energy cluster in Portugal. Considering that the offshore energy cluster is an emerging cluster with high potential for economic performance, namely in the field of environmental services, the research question to be answered is: how can the circular business model be carried out based on the offshore energy cluster in Portugal?

This chapter is divided into four sections, including an introduction to the research questions and main objectives. In the second, "Background", the concepts relevant to this study are introduced and discussed. This section is divided into two main points, the circular economy business model and the offshore energy sector, and the Blue Economy on the circular economy. The third section, "Methodology", deals with the methodology that was used to achieve the research objectives. The fourth section presents the circular economy business model based on the offshore energy sector. Finally, the fourth section presents future research and conclusions.

2- Theoretical background

2.1 The circular business models

"The circular economy provides a framework for facing challenges and a guide for rethinking and redesigning the future" [2]

The construct of the business model (BM) originated in the 1970s and was originally associated with systems modeling in information technology. Since the 1990s, the concept has matured, with contributions from many disciplines, including technology, organization, and strategy theories [3]. The challenge to the economy from new markets and consumer needs points to a new production capacity for industry based on a BM representation of the value chain and its ability to add value to the economy. The BM developed in the circular economy creates value in products and builds needs in consumers. This means that producers and consumers can resort to new forms of product recycling by developing new ways of being in the market [2]. The concept of is BM based on industrial innovation of future productivity and competitiveness between organizations [4]. The phoneme is to create a new value chain to improve a new value in the economy, that is, the circular economy (CE) requires companies to rethink their supply chains and business models [5]. Circular economy (CE) can be described as a concept where there are positive externalities for the economy and the environment. According to [6] CE an approach to address environmental problems and promote sustainable development has recently gained increasing attention in discussions on industrial development. From a different perspective CE, a new vision of how to deal with resources, energy, value creation and entrepreneurship is emerging. Circular business model as "a business model in which the conceptual logic for value creation is based on using the economic value remaining in products after use to produce new offerings", based on these concepts: design waste/design for reuse; build resilience through diversity; rely on energy from renewable sources; think in systems; waste is food / think in cascades / share values (symbiosis) [7]. The circular business model

refers to the value proposition (products and services), value creation (target customers, value creation process), value creation (partners and stakeholders, value creation process) and value appreciation (revenues and costs) [5]. The European policy (2021-2017) emphasizes the following goal: a greener, low-carbon Europe (including energy transition, recycling, climate adaptation and risk management). This implies a new methodology for European production based on clean energy (e.g. offshore energy) and in particular the capacity of industry to address eco-innovation, eco-design and eco-production towards positive externalities. From a European perspective, Energy Communities and consumer (co-)ownership of renewable energy (RE) are essential cornerstones for the overall success of Energy Transition [8]. This implies a close relationship with industrial processes and the value chain in the market. The business model of RED II, is based on a new complementary and cooperative network between citizens, organizations and renewable energy production. According to [9], the renewable energy business model must satisfy these variables: Value proposition, customer interface and infrastructure and revenue model. The goal is to achieve an efficient link between renewable energy production and consumer needs and to be competitive with other energy sources.

2.2 The offshore energy and the circular economy

This point presents the relationship between the offshore energy sector (as part of the maritime economy) and the circular economy. The analysis proposes a new conception of the BM relationship with both views. In [10], the maritime economy is defined as: "all economic activities, sectoral and cross-sectoral, related to the ocean, the sea and the coast. This includes the closest direct and indirect supporting activities necessary for the functioning of these economic sectors, which may be located anywhere, including landlocked countries". The concept of maritime economy presented by [11] and cited in [10] refers to "economic activities that take place in the ocean, derive benefits from the ocean, and provide goods and services to the ocean". Maritime economy is associated with both emerging and established industries at sea. The concept of the maritime economy is also linked to the investments that are made in each maritime sector. The relationship between them is the ability to participate in the market and create flows of services and products. Marine-based industries need to invest capital and generate financial flows, while the marine ecosystem has natural capital assets and does not operate directly in the market. In addition, the marine economy deals with marine-based industries (e.g. renewable energy) and marine ecosystems [1]. The "Blue Economy (BE)" is an increasingly popular concept as a strategy to protect the world's oceans and water resources [12]. The concept of "Oceans Economy" or "Blue Economy" is more recent and dates back to the event Sustainable Development of United Nations Conference Rio de Janeiro in 2012. Assuming the definition of Blue Economy as "sustainable industrialization of the oceans for the benefit of all" and the related criteria, as well as the desired balance between activity and value, several aspects need to be analyzed. This can be considered as activity on one axis and value on the other [13]. The use of renewable energy in the circular economy is a solution for the performance of industrial processes, but also a guarantee of a new methodology of efficiency of the value chain. Some athletes such as [14-15-16-17] describe the circular economy as a solution for the economy to rethink consumption and redesign production due to its concept of low waste. This concept is well accepted knowing that circular economy is related to blue economy, transportation, natural resources, ecosystem quality and human health.

3 – Methodology

The article is based on Pego's previous work [1] on the offshore energy cluster in Portugal. Starting from the original research question: how to perform the circular business model based

on the offshore energy cluster in Portugal, two objectives are presented for this research: 1. to analyze the relationship between the offshore energy cluster and the circular economy and 2. to present a business model based on the offshore cluster and the circular economy projects in Portugal. The qualitative results were divided into two parts, first by Porter Diamond Model and its applicability to the offshore energy sector and then the SWOT analysis. Both methods have been tested [1] and are a good tool to analyze the offshore sector. The study was based on opinions about the future of the offshore energy cluster in Portugal and how future organizations could be involved in the cluster and how the cluster could be linked to the circular economy. The interesting thing was to find the relationship between economic and geographical variables that affect the offshore cluster and its performance in the Portuguese economy. The questionnaire was sent to suppliers, government agencies and others that could positively influence the potential energy cluster in Portugal. The qualitative analysis was based on an electronic questionnaire. This was tested. A total of 14 organizations (belonging to the cluster) were interviewed, divided into private organizations (60%), universities (13%), research centers, public organizations, the government and NGOs (7%). From the questionnaire (qualitative data), a relationship was established between the impact of the use of the circular economy and the use of renewable energy in an earlier phase of the offshore cluster as a business model.

4 - The Business model for circular economy based on the offshore energy cluster

The BM for the circular economy based on the offshore energy cluster is based on the assumption of a new production method. Despite the new era of a conceptual model for the Portuguese CE organization, the European economy is facing a new challenge. Firstly, the concept of circularity in Portuguese business networks is new and consumers need more time to evaluate and understand the concept of circularity [2]. Secondly, the sectors that are beginning to grow under this concept are those with a short value chain, such as the agro-industry. Sectors with a high level of economic specialization and expertise account for a small share of the CE total; thirdly, there is a market strategy for growth at the European level or other markets; fourthly, production factors have a negative impact on circularity; positive externalities in the market (national or international) are one of the objectives of the CE strategy adopted in Portugal [2]. This leads to a new concept of clean innovation, where it underlines the European policy for environment, recycling and smart cities (2021-2027). The results presented by [1] enabled the development of a business model (BM) for the circular economy based on the offshore energy cluster. The Porter Diamond model and the swot analysis methodology conclude that the cluster is ready for new products, new processes, production efficiency and intellectual property. On the other hand, the offshore energy market must develop a strategy to achieve competitiveness and cooperation with other sectors. The market strategy of the cluster refers to energy production, cooperation, capital transfer, specialization of human resources and initiatives/activities related to R&D in the field of renewable energy. From a circular perspective, the offshore energy cluster in Portugal is linked to the production of new value chains, project management and green energy supply. Regarding the complexity of the analysis, it was possible to construct a business model based on the result form the circular economy and offshore cluster in Portugal (figure 2). This means that, a simplified equation from these linkages can be presented based on three domains: circular economy projects and offshore energy projects (a); environment, urban, industries and economic consequences (b) and, principal variables in business (c) (figure 1), where c is the result of the relationship, between a and b.

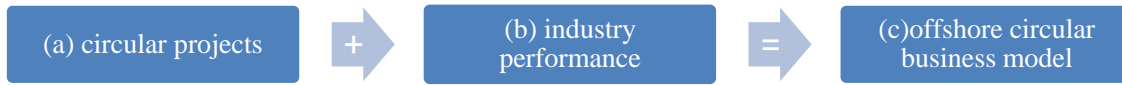


Figure 1: the circular offshore energy equation business model

The impact of the circular business model and the use of offshore energy will contribute to positive externalities, a change in consumer needs and a green value chain. However, it is important to address the readiness of offshore energy stakeholders to create competitive energy supply in cities and create platforms for networking to positive externalities in the economy. Also, the impact on cities, networking platforms, organizational partnerships, and green innovation are part of the variables that will deeply contribute to better use of natural resources and positive impact on the economy based on the ability to create economic value and green manufacturing performance.

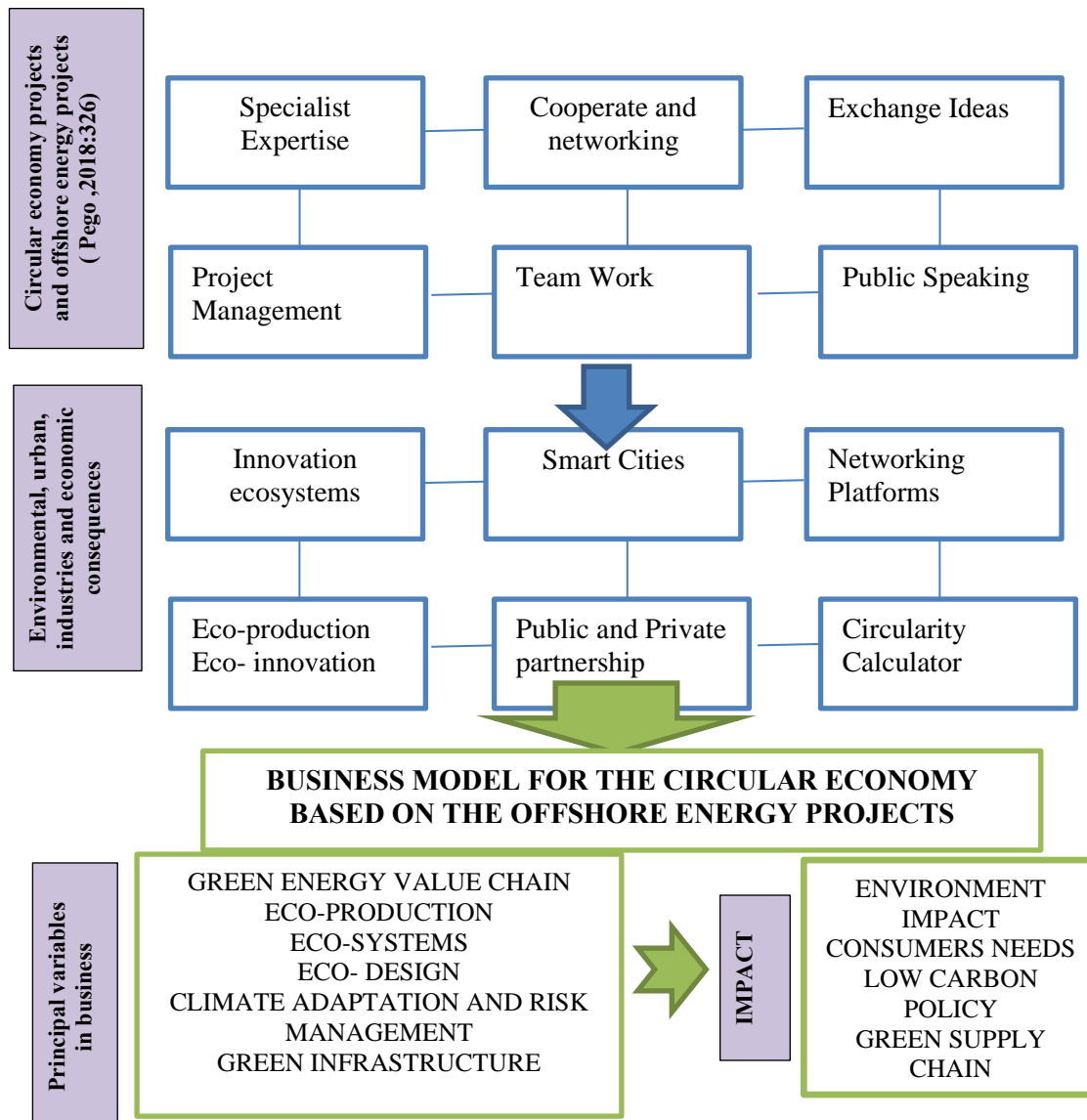


Figure 2 - Business Model for the Portuguese circular economy based on offshore energy cluster

6- Conclusions and further development

The offshore energy sector involves a new business model based on clean technology and welfare, reflecting a new production model based on a circular market. In relation to the point 5 of this article, it is possible to conclude that there is a business model where there are linkages between the circular variables and the offshore cluster. This study confirms a positive relationship between the recycling industry and the offshore energy sector, therefore the answer to the research question reflects a positive link between the variables, the offshore cluster and the circular economy. Considering that the offshore energy sector is an emerging sector in Portugal and is based on innovation, competitiveness, cooperation and collaboration with other sectors, the analysis concludes that the sector will contribute to positive benefits in the industry associated with the use of expertise, cooperation networks and teamwork and project management, leading to widespread use of recycling projects. The business model will contribute to positive benefits in the industry, namely the use of innovation and technology, potential energy, clean technology, investment and knowledge transfer; however, according to the qualitative methodology, there is a lack of linkages between stakeholders and government and regulatory laws and roadmap are insufficient. Further developments could be affected considering the potential of this business model in European economies and its impact on ecosystems, environment and industry due to new rules on production and welfare of citizens. The study can be extended to agriculture and tourism, where production and services still use fuel energy.

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