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THE BLUE ECONOMY: OPPORTUNITIES HIDDEN AT SEA

Whitney Challenger



Introduction

Portugal has a history of being a world maritime power, at one time boasting one of the world's largest fleets and leading expeditions around the world. Portugal now wishes to regain its lost status as a maritime economic power but is still developing a method to achieve it. With its economy needing improvement, attention is being focused on the "blue economy" and its potential to help revive Portugal and regain the country's lost maritime status. Investing in the best situated sectors will be vital to producing blue growth within the small country.

"Blue economy" refers to a combination of a country's maritime and marine economy sectors. While blue economy recently emerged as a popular term in reference to an economy, "maritime" and "marine" have long been used. Oxford Dictionaries defines "maritime" as an adjective that means "connected with the sea, especially in relation to seafaring commercial

or military activity." Therefore, maritime sectors are made up of economic activities that are connected to the sea, directly or indirectly, including shipping and transport, renewable energy, tourism, fishing, water sports, and ocean research, among others. "Marine" describes items that are "relating to or found in the sea," such as marine plants. Maritime sectors cannot be entirely independent of each other because they rely on shared infrastructure and resources, such as ports and the ocean itself ("Blue Growth..." p. 4). Maritime activities are extremely diverse and contribute to a country's economic activity in many different ways.

One factor contributing to a blue economy is the exclusive economic zone (EEZ). As defined in the framework put forth by the United Nations Convention on the Law of the Sea, within an EEZ a country has "sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources...and with regard to other activities for the economic exploitation and exploration

of the zone..." ("Preamble to..." Part V, Article 56). A country has legal jurisdiction over its sea area as well as exclusive access to the resources contained within its EEZ. Therefore, a large EEZ provides more area for a country to fish; to extract resources such as gas, oil, and minerals; to obtain energy (wind and wave); and to undertake various research projects. Although an EEZ provides many opportunities for coastal countries, not all countries are equally able to use it to their advantage. Denmark, for example, has an EEZ that is roughly 2.5 times the country's land mass, and blue economy activities make up as much as 50 percent of the country's gross domestic product (GDP) (Almodovar; Central Intelligence Agency). Portugal, on the other hand, has an EEZ that is approximately 18 times the size of the country, yet blue economy activities only comprise approximately 2 percent of the annual GDP ("National Ocean Strategy 2013-2020," p. 45). Although the coastal European average of 5 percent is not quite as impressive as Denmark's, it is still twice that of Portugal. Despite controlling the tenth largest EEZ in the world, Portugal has not harnessed the sea's opportunities and is not using the EEZ to its full economic potential.

The Blue Growth strategy identified by the European Commission has suggested five sectors as the greatest areas for investment in European coastal countries; however, not all countries have the same strengths and weaknesses. It is unreasonable to assume that all European countries, no matter what their current situation or resources, would benefit equally from attention to the same five areas.

In this article I examine the current status of the five sectors in Portugal and the ongoing efforts in each of the fields in order to evaluate where Portugal's activities currently stand and where they might be capable of going. I conclude by identifying those sectors that hold the greatest potential for economic growth for the country and which are therefore worthy of focused attention by the Portuguese.

European Focus on Blue Growth

In 2007 the European Commission enacted an Integrated Maritime Policy for Europe in which it set goals to grow the continent's overall blue economy by creating sustainable jobs

and growth, investing in research, and educating the workforce (ECORYS, "Blue Growth..." p. 5). The European Commission is the governing body within the European Union (EU) responsible for proposing new legislation to the European Parliament and the Council of the EU (European Commission, "European Commission at Work"). The Integrated Maritime Policy coined the term "blue growth" to represent a "long term strategy to support sustainable growth in the marine and maritime sectors as a whole" (European Commission, "Maritime Affairs"). The policy set the goals of increasing the blue economy from €500 billion gross value added (GVA) to €600 billion and to increase jobs from 5.4 million to 7 million by 2020 (European Commission, "Blue Growth..."). To achieve this, the plan calls for participating EU coastal nations not only to increase activity in emerging markets, such as renewable energy, but also to revitalize traditional sectors, such as shipping and shipbuilding. Although participation in the initiative is voluntary, Portugal chose to join and has worked with the European Commission to set specific goals for its economy. As a result, Portugal is aiming to double the blue economy's contribution to its GDP by the year 2020 ("Government Aims...").

The European Commission supported a study of the maritime economy across Europe by the consulting firm ECORYS, which analyzed sectors for the potential of job creation, research and development (specifically in technology improvements), and innovation (ECORYS, "Blue Growth..." p. 5). ECORYS identified five blue economy sectors that are believed to have the greatest potential for achieving sustainable growth and job opportunities within the EU: aquaculture, nautical and coastal tourism, ocean energy, marine mineral resources, and blue biotechnology. The European Commission believes that, with well-defined policies, the private sector will play a major role in aiding these sectors to reach full potential ("Blue Growth..." p. 7).

The European Commission has suggested focusing on investment and growth in these five areas, as they are believed to have the greatest potential for blue growth throughout all of Europe. However, the question remains: Are these five sectors the best investment strategy for Portugal? Since Portugal's blue economy

currently makes up such a small percentage of the nation's GDP, Portugal could be in a different situation than that of its neighboring countries and may see a better return on investment from some of the identified sectors than others. Some sectors may already be fully developed in Portugal, whereas others have not even been considered. Factors such as infrastructure, a skilled workforce, or other available resources may positively or negatively affect the potential for growth within these sectors. If Portugal is going to use the blue economy as a tool for increasing its economic activity, it is important that it invest in the best opportunities.

In tandem with the European Commission's Integrated Maritime Policy, attention has become focused on each of the seven¹ European sea basins individually. This focused attention included specialized guidance that was more specific and relevant to the corresponding sea territories and an overall push for greater cooperation among nations within the same geographic area. The "Action Plan for a Maritime Strategy in the Atlantic Area: Delivering Smart, Sustainable and Inclusive Growth" follows the general outline of the Integrated Maritime Policy but applies it specifically to the five Atlantic member states.² The Action Plan states that a "combination of efforts in three areas [is necessary] to enable the blue economy to reach its potential in the Atlantic area":

1. Targeting investment. Targeting investment calls for focusing investments on innovation, technology, small and medium-sized enterprise (SME) specialization strategies, and infrastructure.
2. Increasing research capacity. Increasing research capacity specifically in governance, sustainable management of marine resources, and ocean floor mapping and forecasting is key to developing this category.
3. Obtaining higher skills. Obtaining higher skills requires initiatives to increase the skills of the existing workforce in maritime sectors while

also attracting young workers to the fields, in both traditional and up-and-coming sectors ("Action Plan...", p. 4).

External Support for Portugal's Efforts

To carry out the European Commission's maritime strategy and Action Plan, states need access to funding. A primary source of funding for these efforts will come from the member states' Partnership Agreements with the European Structural and Investment Funds (ESIF)³ for the years 2014–2020 ("Action Plan...", pp. 3, 10). The Partnership Agreements will give the countries an opportunity to identify those areas of development most relevant to their current situation and create a plan for the use of funding received from the ESIF. The European Commission also has funds which it directly manages, including Horizon 2020, which focuses on blue growth research and innovation in upcoming years. The Action Plan also encourages member states to make public investments in the initiatives and hopes these will in turn produce private investments. Finally, the European Investment Bank Group is prepared to provide financing in terms of lending to support Blue Growth initiative projects.

EU member states are required to negotiate a Partnership Agreement for the use of ESIF funding with the European Commission. Portugal adopted its Partnership Agreement on July 30, 2014, which creates programming plans centered on the priorities of stimulating job creation and economic growth and outlines activities and funding necessary for Portugal to achieve these goals ("Summary of the Partnership Agreement..."). This agreement lays out how the country intends to use funding received from the ESIF between the years 2014 and 2020. Portugal was initially awarded €392.5 million from the European Maritime and Fisheries Fund (EMFF). The Partnership Agreement states that the EMFF will invest in expanding existing maritime activities to help Portuguese communities create sustainable growth and help Portugal take full advantage of the potential of its maritime economy

¹The Adriatic and Ionian Seas, Arctic Ocean, Atlantic Ocean, Baltic Sea, Black Sea, Mediterranean Sea, and North Sea.

²Ireland, U.K., France, Portugal, and Spain.

³The ESIF are made up of the European Regional Development Fund, the European Social Fund, the European Agricultural Fund for Rural Development, and the EMFF.

("Summary of the Partnership Agreement...").

The €392.5 million provided by the EMFF will be used to accomplish several thematic objectives that Portugal has identified as important ("Summary of the Partnership Agreement...", Table 1). The first objective is to increase the competitiveness of SMEs in the fishery and aquaculture sector, which will receive approximately €214.2 million of the EMFF funding; €11 million will go toward shifting to a low-carbon economy and protecting the environment; another €106.8 million will be used to promote the efficient use of resources. The final allocation of funding from the EMFF will be used toward promoting sustainable and quality employment and increasing labor mobility, which will receive €37 million. Portugal will also be using €23.5 million of EMFF funding for technical assistance. Several other goals declared in the Portuguese Partnership Agreement that could affect the Blue Growth initiative include raising research and development expenditure as a percent of GDP from the 2013 level of 1.5 percent to between 2.7 and 3.3 percent by 2020. Portugal also wants to raise the employment rate of 20–64-year-olds to 75 percent and to raise the share of renewable energy in energy consumption from 24.6 percent in 2013 to the current goal of 31 percent. These initiatives and corresponding funding will be the base for blue economy development in Portugal.

Portugal has been looking to regain its status as a maritime power, and the current Blue Growth initiative in the EU provides it with the external motivation to achieve it. Aid is available to help accomplish this long-term goal, but Portugal should give careful thought to how to go about reaching it. Portugal's economy has suffered significantly with rising unemployment and decreased activity due to the 2010 financial crisis; and with the financial difficulties the country has experienced, Portugal should be cautious to ensure the highest return on investment possible. Although the European Commission's research has identified aquaculture, nautical and coastal tourism, marine mineral resources, ocean energy, and blue biotechnology as the most profitable sectors for investment in Europe, these five sectors may not be equally profitable to Portugal. I analyze the current status of each of these sectors as well as signs of potential growth to determine the best course of action for Portugal.

Sector 1: Aquaculture

Aquaculture is the process of cultivating aquatic organisms using techniques that help the population grow at rates that are higher than the natural environment can sustain (ECORYS, "Blue Growth..." p. 38). The UN Food and Agriculture Organisation has estimated that half of the world's fish consumption currently comes from aquaculture products and that this number is expected to reach 65 percent by 2030 ("Blue Growth..." p. 9). In the EU, 25 percent of fish consumed comes from aquaculture. Aquaculture is the fastest growing animal food-producing sector globally, with an annual growth rate of 6.6 percent; however, the industry is not growing in the EU ("Blue Growth..." p. 9). Challenges for growth in aquaculture include lack of aquatic space, global competition, and licensing. In an effort to overcome these challenges, in 2011 the European Commission set goals of lessening administrative burdens, water access, and competitive advantage and asked EU countries to promote aquaculture through multiyear plans (European Commission, "Fisheries").

Portugal has several advantages in regard to its aquaculture industry. The first is that the products Portugal supplies cannot be obtained naturally from the environment in high enough quantities, and the second is that the industry has earned the reputation of producing high-quality products. These advantages have caused an increase in prices for Portuguese aquaculture products in recent years. In accordance with the national fisheries policy, there has been a movement to increase production figures, quality, and diversity, which is leading firms to obtain organic certification, a modern symbol of quality ("Scientific, Technical..." p. 283). Overall, production is expected to grow due to the anticipated creation of new production farms (p. 285). In fact, in 2013 there was a production volume increase of 50 percent over production in 2012, and many experts are optimistic about continued growth of the sector (Jimenez).

Aquaculture in Portugal also has some characteristics that cause concern when considering the potential for growth. Most of Portugal's aquaculture production takes place in the central and southern (Algarve) regions of

the country, where firms tend to be very small, family-run businesses (“Portugal Wants...”). Of the 1,453 aquaculture enterprises in the country, only 15 employ more than five people (“Scientific, Technical...,” pp. 273–74). The number of such firms in Portugal has remained constant from 2008 to 2011 and has consistently employed approximately 2,300 people. The fact that the number of firms has remained constant suggests that there is not much growth within the industry, because firms entering the field are simply replacing those that have left. The constant employment level also suggests that the aquaculture sector will not help alleviate the country’s unemployment problem.

In 2011 aquaculture sales amounted to €56.8 million—a 22 percent increase over sales in 2010. However, most sales are domestic, with only 6 percent of sales coming from exports (“Scientific, Technical...,” pp. 273, 283). Although the average Portuguese citizen consumes almost three times as much seafood as the European average, it might be difficult to expand aquaculture sales unless the domestic market grows (“Portugal Wants...”). Projects to establish greater capacity or new techniques have been tried in an attempt to try to increase the industry’s size; however, these projects have had only a 20–30 percent completion rate due to the difficulty of small firms acquiring financing from banks (“Scientific, Technical...,” p. 285). Other concerns for the sector are the necessity of governmental reforms due to overly restrictive licensing within the industry and the need for a large amount of investment in off-shore aquaculture, because that is where most of the industry’s potential currently lies (“Portuguese Aquaculture...”). These are two major obstacles affecting Portugal’s aquaculture sector.

In summary, the current SME makeup of Portugal’s aquaculture sector and its lack of growth in recent years are a concern. Other issues, such as a burdensome licensing process and mostly domestic demand, also suggest that future growth may be hard to achieve. These factors could keep Portugal from achieving the economic success envisioned for the aquaculture sector.

Sector 2: Nautical and Coastal Tourism

The second sector for investment suggested by the European Commission is nautical and coastal tourism. Portugal’s natural beauty, beaches, and large coastline provide a great opportunity to advance this sector of the economy. Nautical and coastal tourism is the largest maritime economic activity in Portugal and affects many people in many different areas (ECORYS, “Blue Growth...,” p. 34). The coastal tourism sector contributes €1 billion GVA to the economy each year, employs 50,000 people, and is expected to have positive growth in the short term (ECORYS, “Study on Deepening...,” pp. 21–22). As of 2007 nautical tourism as a whole constituted the reason for travel for 1.2 percent of tourists visiting Portugal, mostly vacationing in the Azores, Madeira, and the Algarve⁴ (“National Strategic Plan for Tourism...,” p. 68). Despite the economic crisis Portugal has faced since 2008, coastal and nautical tourism has had positive performance in both GVA and employment, providing 48 percent of all employment from maritime activities (ECORYS, “Study on Deepening...,” p. 5).

Despite the success of the nautical tourism industry, however, there are still areas for improvement. The National Strategic Plan for Tourism suggests that support infrastructure needs to be developed through investment in order for nautical tourism to grow and to have a greater effect on Portugal’s overall tourism (“National Strategic Plan for Tourism...,” p. 68). The Portuguese government is considering investing in infrastructure through 30 projects deemed to be priorities. On the list is the construction of new cruise terminals at the ports of Leixões (near Porto) and Lisbon, costing an estimated €37.5 million should the projects be chosen (“Portugal’s Top 30 Infrastructure...”). The investment in ports is an opportunity that has very clear benefits for the nautical tourism sector of the economy because, without infrastructure, cruise ships cannot come to port, yachts cannot moor, and there is no support for sportsmen.

⁴The Azores is a region of Portugal made up of nine islands located in the Atlantic Ocean. Madeira is another archipelago in the Atlantic Ocean. The Algarve is the most southern region of Portugal’s mainland and the most popular tourist destination in the country.

These potential investments mainly affect the cruise tourism sector, which contributes 7,500 jobs and an estimated GVA of between €39 million and €170 million to Portugal's economy annually (ECORYS, "Study on Deepening..." pp. 8, 24). Opportunity lies especially in Lisbon, the sixth largest port on the Iberian Peninsula, which has the greatest number of cruise landings in the country (ECORYS, "Study on Deepening..." p. 6; "National Strategic Plan for Tourism..." p. 69). The National Strategic Plan for Tourism states that working with the major cruise operators to improve cruise terminals and routes will be the sector's main challenge ("National Strategic Plan for Tourism..." p. 69). Teaming up with these operators will be vital for growth due to the fact that Portugal currently has only one Portuguese cruise operator, Douro Azul, and is unlikely to begin any new national operations because of the very large investment required to do so and the strong competition within the industry (ECORYS, "Study on Deepening..." p. 24). The difficulty of a new company entering the market was recently demonstrated by the failure in 2015 of a new Portuguese cruise line, Portuscale Cruises, just two years after it started (Coronas). Instead, Portugal should be focusing on creating growth by improving relationships with the main foreign operators to benefit from port dockings and economic activity in the ports (ECORYS, "Study on Deepening..." p. 24).

Other important activities in nautical tourism include yachting and nautical sports (sailing, surfing, and scuba diving), both of which would benefit from investment in infrastructure in order to make Portuguese marinas more attractive ("Maritime..." p. 26). Currently, 65 percent of port moorings and infrastructure providing access to the sea are located in the Algarve and Lisbon, the same areas that have been identified by the Turismo de Portugal as promising areas to develop and to have new marinas built for yachting (ECORYS, "Study on Deepening..." p. 23). Nautical tourism in the Algarve, from marinas and recreational ports, is estimated to produce a GVA of €70 million annually (Perna et al., p. 11, Table 2). Efforts are also being made to increase nautical sports activity in Portugal, which has several estuaries in the Lisbon region and the Algarve that are suitable for such sports. In the northern region

of the country, Sport Club do Porto has undertaken investment projects to increase nautical sports activity through infrastructure construction, whereas the Intercéltica association has been promoting nautical sports ("Maritime Clusters..." p. 26). Other actions facilitating the development of nautical sports include the start-up company SeaBookings, which allows potential tourists to search and compare prices of various maritime activities and even purchase tickets if interested ("Luso-Dutch Student Launches..."). It is efforts such as these that will increase the country's nautical sports activity.

In Portugal, nautical and coastal tourism is an established industry that already contributes greatly to the country through existing businesses. Further developing the nautical tourism segment will help other areas of the blue economy by boosting marine development, increasing shipbuilding, and bringing attention to the coastal environment (ECORYS, "Study on Deepening..." p. 22). The combination of these factors suggests that investing in the nautical and coastal tourism sector is a viable option for stimulating economic growth.

Sector 3: Marine Mineral Resources

Marine mineral mining is a new field that is underdeveloped and currently very small. The focus is not on sand and gravel but rather on extracting such minerals as cobalt, copper, and zinc from the ocean floor ("Blue Growth," p. 11). Seabed mining is an area of focus that is predominantly in the research phase due to little knowledge of what useful minerals exist in the seabed and the lack of technology available to acquire them. The current belief is that there may be a useful supply of minerals in the seabed that could be harvested to help fill gaps in supply, but that it may take several generations to generate sufficient knowledge of the seabed to proceed (European Commission, "Maritime Affairs"). Some expect marine mineral mining to grow from almost nothing to a €10 billion industry worldwide by 2030 ("Blue Growth," p. 11). However, the technology necessary to explore the seabed for minerals is expensive and still underdeveloped, and the prices for the minerals extracted are currently not high enough to cover the costs (ECORYS, "Blue Growth," p. 50). Additionally, potential environmental

impacts from this process are a growing concern. Whether it is feasible for mining companies to shift to seabed mining and whether the resources are even available are still unknown. Therefore, the future of this marine sector is uncertain.

Portugal's seabed is suspected of having the right conditions for large deposits of zinc, copper, cobalt, gold, silver, and manganese, among others ("National Ocean Strategy 2013-2020," p. 47). Currently, Portugal's EEZ surrounding the Azores is being used by a consortium called Blue Atlantis, which is setting up a deep-sea mining test facility ("Innovative Mining..."). Blue Atlantis is made up of 45 entities, 12 of which are Portuguese, that are conducting research on all aspects of the deep-sea mining value chain, from mining equipment development to exploration for locating minerals to environmental monitoring.

Marine mineral mining is an up-and-coming field, but it is still in the beginning stages, unable to deliver any immediate economic benefit to Portugal. Much more research needs to be done on the available resources, necessary technology, and environmental impacts before this field can move from academia into industry. This makes marine mineral mining an unlikely candidate for investment at this time.

Sector 4: Ocean Energy

Having examined the first three of the European Commission's suggested blue economy sectors, I turn to the fourth: ocean energy. Ocean energy exists in many forms, including offshore oil and gas, wind energy, wave and tidal energy, thermal energy, and algae as a biofuel. Since 1978 Portugal has been researching and developing ocean energy, mostly wave energy (European Ocean Energy Association, p. 32). In recent years Portugal has been investigating this area for potential economic activity, but overall the sector is still in the research phase and not yet ready for commercial use. Portugal, however, does have a high dependency on foreign energy and could benefit from a new outlet for domestic production. Creation of an offshore energy industry would also have positive effects on other industries, such as ports, which would need to be developed to aid the energy industry. In an effort to find outlets for an ocean ener-

gy industry, some exploration has been done in Portuguese ocean territory to identify areas of fossil fuel, but none have yet been found (ECORYS, "Study on Deepening..." pp. 17–18).

Nonetheless, offshore wind energy is an area that does have potential for Portugal. The country's large sea area, along with the fact that most of its infrastructure and population are located along the coast, provides a good basis for the creation of a wind energy industry (ECORYS, "Study on Deepening..." p. 18). Portugal is currently in an experimental phase in regard to wind energy, with a couple of projects (one using a wind turbine) that are connected to the electrical grid and are producing energy (ECORYS, "Study on Deepening..." p. 18). Across Europe, employment in the offshore wind energy sector is expected to grow at a rapid pace, from 35,000 in 2010 to 170,000 in 2020 (ECORYS, "Blue Growth..." p. 42). Portugal is expected to benefit from the creation of 7,000 jobs directly related to ocean energy (Melo).

Another much discussed ocean energy resource is wave energy. Portugal has been identified as a likely contender to benefit from wave energy in the future once the technology is developed (ECORYS, "Study on Deepening..." p. 19). Several projects researching possible technologies for offshore wind and wave energy are ongoing off Portugal's coast at three testing facilities: the Pico wave energy plant, the Aguçadoura site, and the Pilot Zone (European Ocean Energy Association, p. 33). The Pico plant is located on Pico Island in the Azores, the Aguçadoura site is located off the northern coast, and the Pilot Zone is off the central coast. Some wave energy capacity is expected to be installed by 2020; however, there is debate over the potential value that may be created by wave energy, because there are many technological difficulties that need to be overcome (ECORYS, "Study on Deepening..." p. 19; European Ocean Energy Association, p. 33).

In addition to the research being conducted on wind and wave energy, research on the use of seaweed to produce renewable biofuels, called algae energy, is also currently underway. Algae energy is expected to grow in importance for Portugal, which has the natural conditions necessary to produce ethanol-rich varieties of algae (ECORYS, "Study on Deepening..." p. 19).

In summary, Portugal appears to be a viable candidate for the ocean energy sector. Much research is being done in the field, especially in Portugal, which has test sites, resources, and companies that are already investing in the industry. Prospects seem good that Portugal will be able to turn ocean energy into a viable industry. In particular, renewable energy from wind and waves seems possible and could help decrease the country's dependency on foreign energy. Growth of this sector will also create jobs and encourage growth of related industries, specifically along the coast. For all these reasons, ocean energy is a good candidate for further investment and attention from Portugal.

Sector 5: Blue Biotechnology

The European Commission has identified blue biotechnology as the fifth sector for focused investment. This field is also still in the early research phase and is broadly defined as using ocean resources to produce products for technology applications in manufacturing, particularly in the pharmaceutical, cosmetic, and chemical industries (ECORYS, "Blue Growth..." p. 47). Access to financing will be a concern for the success of this sector, to pull it from the research phase into development. However, the sector also provides the opportunity to positively affect many other maritime industries with the creation of useful new products (ECORYS, "Blue Growth..." p. 48).

Portugal has high expectations for the blue biotechnology field, anticipating a 5 percent annual growth rate for the industry and ranking it as the most promising maritime economic activity (ECORYS, "Study on Deepening..." pp. 16, 32). The country already has a number of companies established in the field, which employ a small number of highly skilled workers trained in many different fields (ECORYS, "Study on Deepening..." p. 17). Portugal's largest biotech research institution is the Instituto de Biologia Experimental e Tecnológica, iBET, which works together with companies and research institutions to develop products the industry wants. Another established company is Bioalvo, which collects resources from the Azores to produce cosmetics and pharmaceuticals ("Bioalvo Explores..."). Much of the current Portuguese blue biotech business is

international. These companies, coupled with more than 50 centers for marine research, and abundant natural resources put Portugal at the forefront of the biotech sector (Erwes and Pitta e Cunha, p. 2).

Although blue biotechnology is still in its early stages and may be seen as a risky investment, the sector holds much potential for Portugal. The country already has blue biotech companies in operation, and current research is expected to lead to further advancements in the field. This would be a long-run investment for Portugal but one that has a strong potential for producing high returns.

Conclusion

Across Europe, countries are turning to the oceans with hope for new opportunities and the potential for economic growth. In response to this opportunity, the European Commission has issued its Blue Growth initiative and identified Europe's blue economy as a catalyst for economic gains. Throughout this article, I have analyzed Portugal's prospects for investment in each of the five blue growth sectors. The Portuguese aquaculture and nautical tourism industries are already well established, whereas the ocean energy and blue biotechnology industries are in the early stages of development. The future of the marine mineral resources industry is still uncertain. Based on this research, I conclude that nautical tourism, ocean energy, and blue biotechnology are the most promising fields for Portuguese investment, whereas the outlook for aquaculture and marine mineral resources is less favorable. Nautical tourism is an industry already developed in Portugal with a high demand and much room for further growth. Ocean energy and blue biotechnology both have well established research initiatives and considerable opportunities for long-term growth. Although aquaculture is an established sector in Portugal, its current SME structure seems restrictive for growth, and the unknown status of marine mineral resources in Portuguese waters makes investment risky. Therefore, wise investment with a focus on nautical tourism, ocean energy, and blue biotechnology will provide Portugal with an opportunity for growth and economic success, both short and long term.

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