DISCUSSION PAPER

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CONTENTS

ABSTRACT

The interaction between the sea and the economy gives this environment enormous strategic importance. The forms of economic exploitation are diverse and include sectors such as energy, fishing, tourism, transportation, biotechnology, and shipbuilding. For Brazil, country with an extensive coastline and vast maritime space, its relevance is especially evident. In this scenario, it is fundamental to elaborate public policies aimed at maritime economic activities. For this purpose, a survey of the numbers referring to such activities is essential for a correct understanding of their dimension. Thus, the objective of this text is to point out the importance of measuring in a continuous and systematic way the Brazilian Maritime GDP, through a specific methodology, as well as to identify the main motivation for this initiative. Based on the descriptive inference method and on bibliographic survey, it was possible to verify the need to use updated data to support the formulation of public policies and decision-making on the subject, as well as to broaden the debate within other actors, such as academia, private sector and civil society.

Keywords: blue economy; maritime GDP; Blue Amazon; maritime economy; public policies; Science, Technology and Innovation.

SINOPSE

A relação entre o mar e a economia confere a esse ambiente enorme importância estratégica. As formas de exploração econômica do mar são diversas e abrangem setores como energia, pesca, turismo, transporte, biotecnologia e construção naval. Para o Brasil, país com extenso litoral e amplo espaço marítimo, sua relevância mostra-se especialmente evidente. Faz-se fundamental, nesse contexto, a elaboração de políticas públicas voltadas para as atividades econômicas realizadas nas águas brasileiras. Para tanto, o levantamento dos números referentes a tais atividades é de fundamental importância para a correta compreensão de sua dimensão. Nesse sentido, o objetivo deste texto é apontar a importância de se mensurar de maneira contínua e sistemática o produto interno bruto (PIB) do mar brasileiro, por intermédio de uma metodologia específica, bem como identificar as principais motivações para essa iniciativa. Baseando-se no método de inferência descritiva e na realização de levantamento bibliográfico, foi possível verificar a necessidade do uso de dados atualizados como apoio para a formulação de políticas públicas e para a tomada de decisão sobre o tema, bem como a ampliação do debate junto a outros atores – a exemplo da academia, do setor privado e da sociedade civil.

Palavras-chave: economia azul; PIB do mar; Amazônia Azul; economia do mar; políticas públicas; ciência, tecnologia e inovação (CT&I).

1 INTRODUCTION

Brazil is a country of continental dimensions and has the sea as an important asset. With an area of approximately 3.6 million km² and more than 7,000 km of coastline,[1] the territorial sea, the exclusive economic zone (EEZ), and the continental shelf form a space that was named Blue Amazon[2] and encompasses economic, social, environmental, cultural, and geopolitical aspects, constituting an extensive area under national jurisdiction and of strategic importance to Brazil. It is a space equivalent to more than 50% of the country's continental area that still lacks, in many aspects, integrated planning, management, and plans for the sustainable use of existing resources.

According to the Brazilian Navy (MB), the Blue Amazon is understood as "a political-strategic concept that covers the region that comprises the sea surface, waters overlying the seabed, marine soil and subsoil contained in the Atlantic extension that projects from the coast to the outer limit of the Brazilian Continental Shelf. It must be interpreted from four perspectives: economic, scientific, environmental and sovereignty",[3,4,5] referring also to "the importance of Maritime Power to Brazil".[6] In this context, there are different possibilities of exploiting resources not only in the maritime space, but also on land, through different economic activities related to the sea. Although it is not an object of this study, it is worth mentioning the importance of the National Coastal Management Plan (Law No. 7661, May 16th, 1988). It is noteworthy that the coastal strip of Brazil is home to 13 capital cities and more than 30 million inhabitants (IBGE, 2019). Among the country's 26 federative units, only nine do not have access to the sea, which reinforces the great need for adequate and sufficient coordination among the federative entities regarding the construction of public policies and the treatment of this agenda.

1. From studies carried out in the scope of the Brazilian Continental Shelf Survey Plan (LEPLAC), Brazil has forwarded different requests to the United Nations Commission on the Limits of the Continental Shelf (CLPC) in recent years. If the proposals are accepted in their entirety, the maritime area under national jurisdiction will reach about 5.7 million km², considerably expanding the potential to be explored by the country in the Blue Amazon. For more details, see Silva, A. (2021).

2. The term Blue Amazon was coined by the Brazilian Navy to designate the Brazilian Jurisdictional Waters, a region that corresponds to about 52% of the national continental surface, approaching, in size, the country's Amazon surface (Beirão, Marques and Ruschel, 2020). The initiative aimed to make society aware of the important heritage existing in the national maritime territory.

3. This concept was adopted since July 2021, at EMA publication – Naval Military Doctrine (Mod 1).

4. For more information about the four perspectives, see: <https://bit.ly/3N2e9cM>.

5. It should be noted, however, that Brazilian inland waters are not included in the scope of this study.

6. See: <https://bit.ly/3J6Yirq>.

More than 90% of all Brazilian foreign trade passes through Brazilian Jurisdictional Waters (AJB), according to the MB.[7] Oil and natural gas (P&G) exploration, including mineral reserves in the Pre-Salt layer, naval industry, port activities, shipping, fishing and aquaculture, biotechnology, marine mining, water sports, communications with other continents through submarine cables, renewable energy,[8] and tourism, including cruise ships, hotels, restaurants, bars, and nautical leisure among others, impacting the economy, society, environment, infrastructure, and jobs.

The relationship between the sea and the economy is consolidated in this environment, reinforcing its strategic importance for the country. Therefore, a vision of the sea as a source of economic growth is highly promising, based on the sustainable use of living and non-living resources present there and also on the various benefits for the country and, in particular, for coastal regions. From new technologies, a new economic frontier is identified in the ocean, in the context of the so-called "blue economy". Thus, the sustainable exploitation of the potential of the sea, especially in the context of anthropic actions on the oceans and the growing phenomenon of the Industrial Revolution – or industrialization – of the oceans (Carey, 2015; Stocker, 2016; Vermeer, 2019), demands the development of specific public policies and also more robust investments in Science, Technology, and Innovation (ST&I).

Consolidated at the United Nations Conference on Sustainable Development, held in Rio de Janeiro in 2012 (UNCTAD, 2014), the concept of blue economy has different definitions, structured from the understandings of countries, organizations, or even specific sectors. According to the *Center for the Blue Economy*, a North American institution linked to the Middlebury Institute and focused on research on the subject, the blue economy encompasses three related but distinct meanings – the overall contribution of the oceans to economies, the need for a treatment of the subject based on the ecological and environmental sustainability of the oceans, and the ocean economy as a growth opportunity for both developed and developing countries.[9,10,11]

7. See: <https://bit.ly/3J6Yirq>.

8. As will be detailed throughout the text, Brazil has promoted and adhered to initiatives regarding the development and implementation of submarine cables – such as the undertaking that connects Brazil and Europe by fiber optic cables, inaugurated in June 2021, and the project that will link South America to Australia, still in its initial phase (Adesão…, 2021; Cabo…, 2021; Bucco, 2021).

9. There is, however, a high level of disparity among countries when it comes to taking advantage of opportunities related to the Blue Economy – the result of a greater capacity of developed countries to explore the potential of the seas and oceans.

10. See *What is the "Blue Economy"?* Available at: <https://bit.ly/3e4Kbo6>.

11. Such aspects related to the Blue Economy have been debated, in several scopes, in different researches conducted in Brazil (Beirão, Marques and Ruschel, 2020; Carvalho, 2018; Andrade et al., 2021; Santos, 2019; 2020).

The United Nations, in turn, presented a broader definition of blue economy as "an ocean economy that aims at the improvement of human well-being and social equity, while significantly reducing environmental risks and ecological scarcities" (UN, 2014). In 2017, the World Bank, in turn, defines blue economy as "the sustainable use of ocean resources for economic growth, improved livelihoods and jobs, while preserving the health of the ocean ecosystem".[12]

Thus, it is important to demonstrate that there is no single definition of blue economy, but rather different conceptualizations that vary according to the different actors involved (Voyer et al., 2018). When dealing with Blue Economy, more than just thinking about economics, it shows to be necessary to go beyond to build a "sustainable ocean economy" (Ryabinin, 2021, p. 9), from, fundamentally, an approach that integrates social, economic, and environmental perspectives on the subject (European Commission, 2021).

This framework of elements related to the fields of economics and public policies brings different challenges to the countries. In the case of Brazil, the extensive national maritime space provides great opportunities for the sustainable use of its potential. However, the different possibilities also result in challenges of different natures to be overcome by the country – such as the protection of marine ecosystems, the socioeconomic vulnerability of certain social groups, and the tendency to privatize the activities developed in the oceans (Virdin et al., 2021). In this sense, it is essential to develop and improve public policies and regulatory frameworks aimed at different activities related to the Brazilian sea – as well as the high seas, as will be observed throughout the text – for example, of economic, social and environmental nature. To this end, the collection of updated data on such activities is highly relevant for a more accurate understanding of the economic potential of this area, allowing us to verify how much they represent in the Brazilian Domestic Product (GDP).

The domain of up-to-date and adequate information about each sector is fundamental for a more effective and comprehensive understanding of the Blue Economy. In this sense, the concept of "*data-driven* economy" reinforces this proposition. It is, objectively speaking, the strategic use of data to support decision-making (Smichowski et al., 2019; Ciuriak, 2018). The increased volume of data available through new technologies – such as *big data* and *Internet of Things* (IoT) – brings new possibilities, but also new risks and challenges. Thus, it becomes paramount to possess knowledge through data and information, increasingly strategic assets for the development, monitoring, and updating of public policies (Haucap, 2019; Grafenstein, Wernick and Olk, 2019; Brasil, 2020a). The perspective presented, therefore, ratifies the importance

12. Available at: <https://bit.ly/33uxOzH>.

of accurately and permanently measuring the potential of the Brazilian sea – and consequently the country's GDP of the Sea[13] – in order to enable its sustainable exploitation and to identify the main existing challenges and risks.

This study is based on the descriptive inference method, conducting a bibliographical survey, as well as consulting official sources. Its objective is to point out the importance of measuring, in a continuous and systematic manner, the so-called GDP of the Brazilian Sea,[14] by means of a methodology to be implemented and officially recognized by the State. The aim is to answer the following research problem: what are the main motivations for the systematic measurement and monitoring of the Brazilian GDP of the Sea? In this sense, it is hypothesized that there are social, economic and environmental motivations that recommend a more attentive and effective look by the State.[15]

It is therefore essential to deepen research on this topic, since it can be of great value for a better insertion of Brazil in the context of the blue economy, especially in light of the Decade of Ocean Science for Sustainable Development[16] established by the United Nations (2021-2030), and for a better adaptation of policies adopted at the national level based on recent data, as well as contribute to the exercise of domestic jurisdiction in processes whose implications are beyond the country's borders. Finally, more broadly, this work also seeks to contribute to stimulate knowledge and debate in society about the importance of the Blue Amazon. Thus, this work intends to conduct a relevant study, contributing to the debate on issues related to the blue economy and the GDP of the Brazilian sea.

13. From the OceanPanel perspective, five building blocks are necessary to build a sustainable ocean economy: i) use data to drive decision making; ii) engage in goal-oriented ocean planning; iii) reduce financing risk and use innovation to mobilize investments; iv) stop land-based pollution; and v) change the ocean's accounting to reflect the true value of the ocean. In this last block, the key action is to develop complete sets of national ocean accounts.

14. The term "GDP of the Sea" has been found in academic works in Brazil and is being used in discussions on the subject in official circles. An example of this use can be found in the creation of the Technical Group "GDP of the Sea" by the Interministerial Commission for Resources of the Sea (CIRM), as will be pointed out throughout this text. One can also observe, in a similar way, the existence of concepts such as "GDP of Agribusiness" and "Industrial GDP", calculated by official agencies and routinely used by the financial market, academia, research institutes and the press in the country.

15. Although the present text focuses on justifications related to the three areas presented – social, economic and environmental – it also recognizes the existence of other motivations for measuring and monitoring the Brazilian Sea GDP, such as geopolitical and food security aspects.

16. See: <https://bit.ly/3L3KoGA>.

This text is divided into three sections, in addition to this introduction. The second section aims to present the main economic activities related to the sea carried out in the country. The third section, in turn, seeks to point out the main instruments that organize the management of Brazil's maritime space, considering the public policies regarding the Blue Amazon. Finally, the last section of this text presents the final considerations and recommendations.

2 BLUE ECONOMY: THE RELEVANCE OF MEASURING THE BRAZILIAN SEA GDP FROM A SECTORIAL PERSPECTIVE

Since there is not a single concept of blue economy, as pointed out earlier, it is worth examining the main existing notions in order to allow a global understanding of the most substantial ways of characterizing the sectors and activities that make up the blue economy and their contribution to national economies. In this way, it becomes possible to establish guidelines for the approach to the subject in Brazil and for the institution of national public policies related to the sea. In general, different conceptualizations of the economic activities related to the sea can be observed in countries around the globe, as illustrated below (Carvalho, 2018).

In the United States, the *National Ocean Economics Program* (NOEP) defines oceanic economy as any economic activity that comes (even partially) from the seas or Great Lakes of the country.[17] Regarding the sectors that make up the U.S. ocean economy, they are organized into six: i) construction; ii) living resources; iii) minerals; iv) ship and boat construction and repair; v) recreation and tourism; and vi) transportation.[18] Tourism and recreation account for most of the jobs and values generated within the blue economy – 73% and 41%, respectively. It is worth noting that the share of *offshore* mineral extraction is the second most-generating subsector in U.S. GDP among offshore activities – reaching about $80 billion in value generated in goods and services, compared to $124 billion in the tourism and recreation subsector.

In the United Kingdom, in turn, the categorization of activities related to the sea contemplates the sectors that involve working in the ocean and working with the ocean (Pugh, 2008). The country lists in detail, as part of its blue economy, eighteen sectors: i) oil and gas; ii) ports; iii) marine transport operations; iv) leisure and recreation; v) equipment and materials; vi) defense; vii) submarine cables; viii) service provision; ix) boat and ship building; x) fishing; xi) marine environment; xii) R&D; xiii) construction; xiv) navigation and safety; xv) aggregates; xvi) licenses and rentals; xvii) education; and xviii) renewable energy (Pugh, 2008).

17. See: <https://bit.ly/32kHU5U>.

18. See: <https://bit.ly/32kHU5U>.

Another European country with well-consolidated studies on the blue economy, France has defined the group of economic activities directly and indirectly related to the sea (Girard and Kalaydjian, 2014). Thirteen sectors are covered: i) coastal tourism; ii) seafood; iii) ship repair and construction; iv) marine and river transport; v) marine aggregates; vi) energy; vii) civil engineering: marine and river; viii) submarine cables; ix) *offshore* oil and gas services and equipment; x) french navigation; xi) public intervention in marine issues; xii) protection of the coastal and marine environment; and xiii) marine sciences (op. cit.).

Chile is the country with the second largest maritime area in South America, behind Brazil, and has in the sea an important resource for its economic development. Among the priority sectors indicated by its National Ocean Policy are fishing and aquaculture, port infrastructure and maritime transport, naval industry, mining, energy, tourism, and innovation. The sustainable use of marine spaces and resources underpins the stated objectives and actions set out in the document, which highlights the biodiversity and productivity potential of Chilean waters (Chile, 2018).

Another relevant document of Chile in the scope of ocean policy and ocean protection is the National Biodiversity Strategy, which includes the Strategy and Action Plan for the Conservation of Marine Biodiversity and Ocean Islands, meeting, including, the provisions of Agenda 2030 and the Sustainable Development Goals (SDGs) of the United Nations.[19] The Chilean ocean policy, in general, "constitutes a new step towards the consolidation of [the country's] commitment to international ocean governance" (Chile, 2018, p. 6). In this way, international regimes and regional cooperation are mentioned as priorities regarding the country's public policies on the subject (op. cit.).

China has excelled in the development of its coastal and ocean economy, resulting in the strengthening of several sectors related to the blue economy. The activities related to the sea are divided into twelve main sectors: i) marine fishing; ii) *offshore* oil and gas; iii) mining; iv) sea salt industry; v) shipbuilding; vi) marine chemical industry; vii) marine biomedicine; viii) marine engineering and construction; ix) marine electric power; x) sea water use; xi) marine communication and transportation; and xii) coastal tourism (Zhao et al., 2013).

It can be observed that, in general, the sectors classified from the definitions above are similar, being related to primary, secondary or tertiary economic activities that have some direct or indirect relationship with the sea – or, in some cases, with the sea, rivers and lakes (Carvalho, 2018). The conceptualization and identification of the sectors that comprise it are fundamental to the development

19. It is worth noting that Agenda 2030 (2016-2030) and the Decade of Ocean Science for Sustainable Development (2021-2030), both under the United Nations (UN), have great potential to promote the blue economy (Santos, 2020).

of these activities. It is noteworthy that the measurement of sea-related activities in a given country – and, consequently, of its GDP of the Sea – requires specific initiatives, starting with the classification of economic sectors related to the sea, going through rigorous data collection, until estimates of spending, number of jobs, and wages in such sectors are reached (Kildow and McIlgorm, 2010). Moreover, it is noteworthy that the blue economy can be understood as an analytical and strategic tool, ultimately contributing to the formulation of public policies in the country – considering, for example, elements related to the data-based economy and its potential for innovation (Santos and Carvalho, 2020).[20]

Taking into account the objective of this study – to point out the importance of measuring the GDP of the Sea in Brazil – as well as the aspects pointed out above, this section will present a brief characterization of the different economic sectors that make up the blue economy in the country. An attempt was also made to group related activities into broad sectors, so as not to evade the exploratory purpose of this study. Thus, with regard to activities related to the sea in Brazil, the sectors analyzed in this work are: i) marine mining; ii) renewable and non-renewable *offshore* energy; iii) fishing and aquaculture; iv) shipping; v) tourism; and vi) naval industry.[21]

2.1 Marine mining

The sea is also full of non-living resources, such as polymetallic nodules, manganese, iron, calcium carbonate and several other minerals, in addition to oil and natural gas, so that marine mining is also an important activity for the economic development of Brazil (Brasil, 2020a). It is necessary, in this sense, to evaluate the mineral potential of the national blue economy, in addition to acquiring and improving the scientific and technological knowledge necessary for the prospection and exploration of these areas – especially shallow ones. The quantification of mineral assets existing in the Brazilian maritime territory will allow a better evaluation in terms of meeting national demands, enhancing the direct and indirect contributions of the sector to the country's GDP (Brasil, 2020a).

With regard to the management of this activity in the country, the extraction industry and the following classes of activities stand out: i) extraction of oil and natural gas; ii) extraction and refining of sea salt and rock salt; iii) extraction of gems (precious and semi-precious stones); iv) support activities for the extraction of oil and natural gas; v) support activities for the extraction

20. See: <https://bit.ly/3pfFaPU>.

21. The division of these sectors in the present text was based on the organization of economic activities established by the IBGE, Carvalho (2018) and on the literature review carried out throughout the research. It is recognized, however, that there are divergences about the sectors that make up the blue economy in the different countries presented, emphasizing also the exploratory nature of this work.

of minerals other than oil and natural gas; and vi) manufacture of machinery and equipment for oil prospecting and extraction. In this context, it is worth highlighting the attributions of the National Mining Agency (ANM), the institution responsible for several studies and approvals in Brazil regarding mineral exploration in national waters, the identification of potential areas for the activity and its regulation.

After sending expeditions and collecting rock samples, Brazil applied to the International Seabed Authority (ISA) – a United Nations (UN) body responsible for regulating activities on the ocean floor in international waters – for mineral exploration in the area, and this application was approved in 2014. In December 2018, Brazil forwarded to the Commission on Continental Shelf Limits (CLPC) the proposal to extend its continental shelf on its eastern margin, which would include, if approved, the Rio Grande Rise in Brazilian Jurisdictional Waters. Following the procedures for requests of this order, the analysis of the Brazilian submission should take place as of 2023.

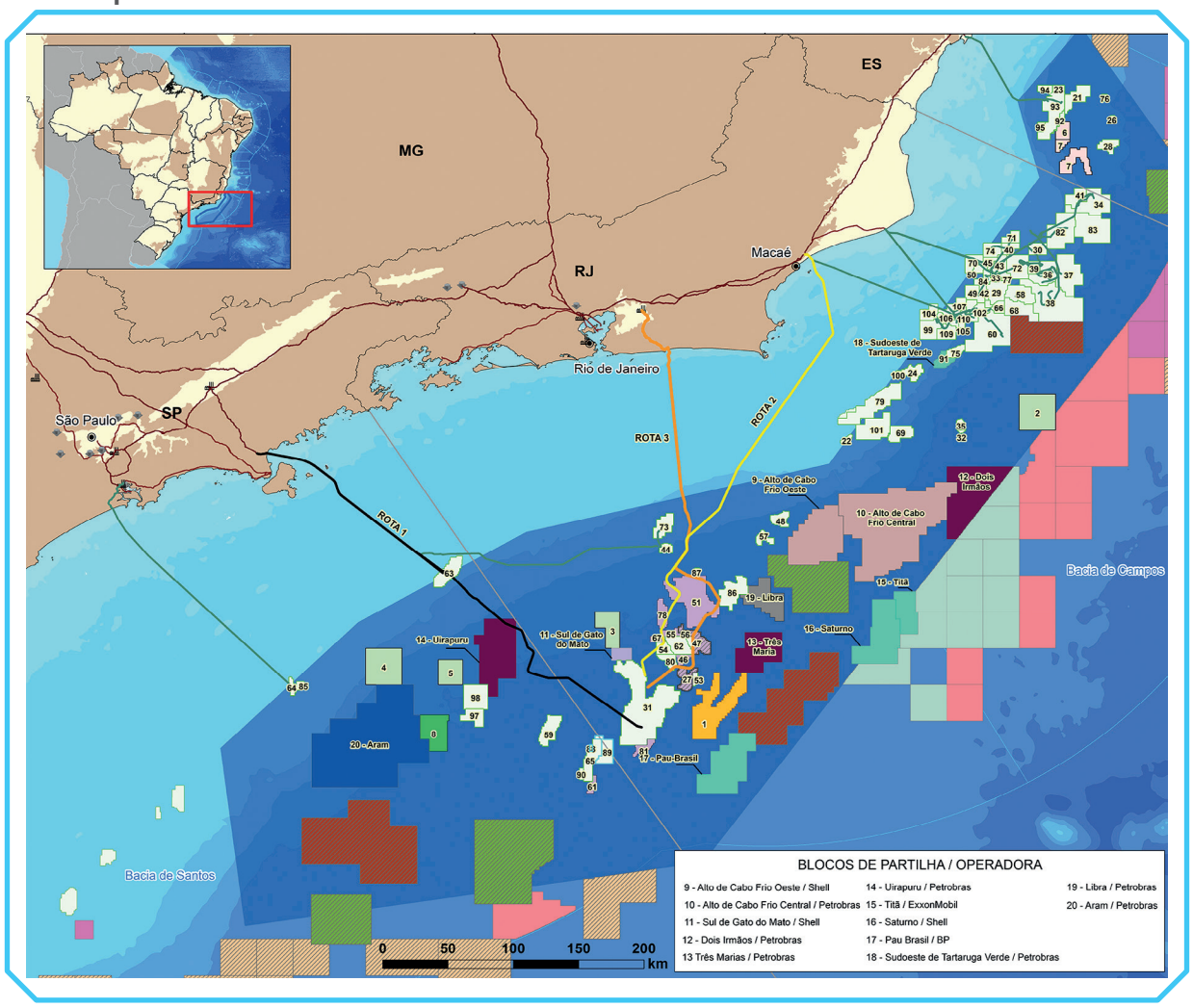
2.2 Offshore renewable and non-renewable energies[22]

2.2.1 Offshore non-renewable energy

In terms of non-renewable energy sources from the sea, the oil and natural gas (P&G) sector stands out in Brazil. The P&G extraction activity corresponds to an important portion of jobs and, consequently, income generation – both in the extraction process itself and in the support activities. The growth in the number of jobs in this activity can be understood from the discovery of the Pre-Salt layer off the Brazilian coast, announced by Petrobras in 2006. The resources contained in this layer consist of large deposits located below the seabed, under more than three kilometers of rocks below the seabed, extending from the coast of Espírito Santo to the coast of Santa Catarina, reaching approximately 150 thousand square kilometers of area.[23] Figure 1 shows the Pre-Salt area, comprised entirely on the Brazilian Continental Shelf.

22. See: <https://bit.ly/3ejuI3z>.
23. See: <https://bit.ly/3J8Ww99>.

FIGURE 1
Map of Pre-Salt in Brazil



Source: ANP, 2019. Available at: <https://bit.ly/3wedU8z>.
Publisher's note: Figure whose layout and texts could not be formatted and proofread due to the technical characteristics of the original files.

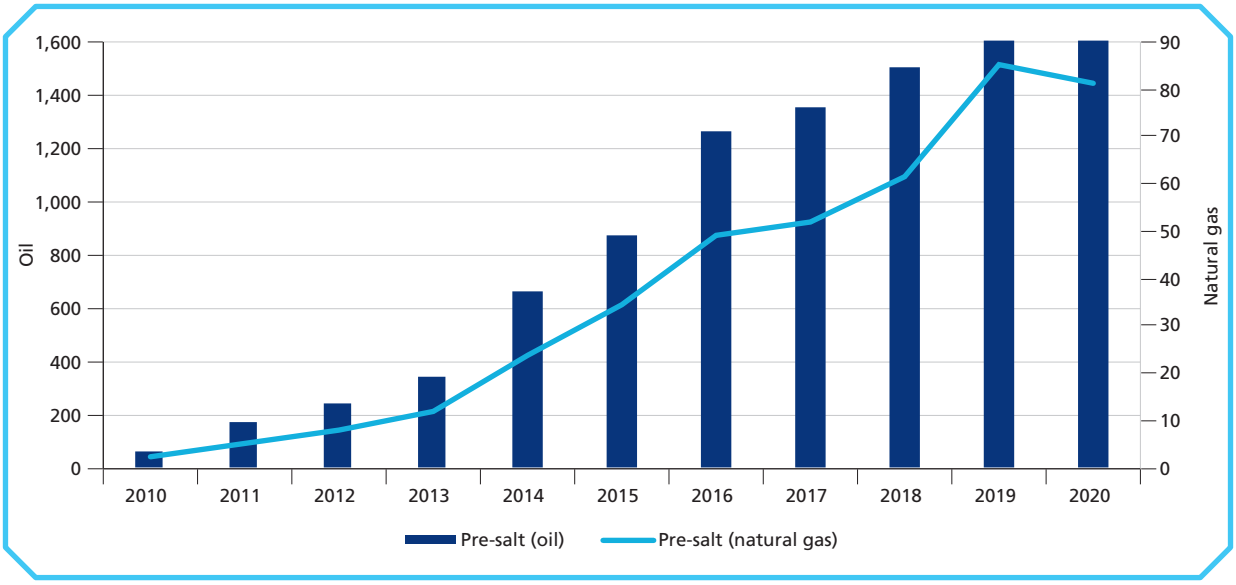
Since 2010, when the production of oil and natural gas in the pre-salt began, the volume produced has shown consistent growth. As shown in chart 1, in September 2010, pre-salt production was 50.78 thousand barrels of oil per day (Mbbl/d) and approximately 11.9 thousand barrels of oil equivalent per day (Mboe/d) of natural gas, jumping to about 1.9 million barrels per day of oil and 81 thousand barrels of natural gas in December 2020. In the same period, the number of production wells in the pre-salt jumped from 4 to 119. To reinforce the relevance of the pre-salt for the national production of oil and natural gas, in December 2020 the production

of these resources in the pre-salt reached 69% of the total produced in the country.[24] It is worth noting that recent ANP auctions covered several areas with high prospecting potential – located on the Brazilian equatorial margin – which brings the prospect of expanding production numbers in the coming years.

CHART 1

Pre-salt oil and natural gas production (2010-2020)

(In thousand barrels of oil equivalent/day)



Source: ANP.

It is also worth pointing out the existence of resources with great mining potential in international waters close to the country's Continental Shelf – such as the cobaltiferous crusts existing in the area called the Rio Grande Elevation. Located about 1.5 thousand kilometers off the Brazilian coast, the region presents great potential for exploitable mineral resources, which has stimulated research and mapping by the Brazilian Geological Service (CPRM) and the Brazilian Navy, jointly, since 2009 (Brazilian Navy, 2019).

Despite the impact suffered in the sector due to the pandemic of Covid-19, the P&G sector will still continue to play a key role in the global energy scenario (Turk and Kamiya, 2020). Internationally, there has been an impact on production, falling prices and postponement of investment plans;

24. As a result of the Covid-19 pandemic, 34 production fields (offshore and onshore) and 60 offshore facilities had their activities temporarily halted, impacting the total volume of oil and natural gas produced (Brasil, 2021).

nationally, exchange rate and interest rate changes have affected the dynamics of the commodity market, which has a concentrated destination – more than 50% for the Chinese market (IBP, 2020).

Concentrating more than 80% of the total *downstream* workers, the P&G sector has been the target of problems related to the new coronavirus pandemic. The National Petroleum, Natural Gas, and Biofuels Agency (ANP) has recorded more than 3,000 cases of Covid-19 on offshore P&G platforms (through May 2021), leading to the need to reduce the operation of certain platforms.

Regarding the prospects for the sector, particularly with regard to the blue economy, it is worth highlighting the opportunities related to the decommissioning of platforms. There are different purposes for such platforms, which can even serve as a basis for the promotion of offshore renewable energy, as in the case of offshore wind energy.

2.2.2 Offshore renewable energies

The potential of energy resources from the sea has attracted growing interest from scientific communities and governments around the globe. The use of the sea to generate clean energy is promising, especially because of its renewable nature. We highlight, in this sense, technologies that allow the exploitation of tides (tidal energy), waves, marine currents, thermal gradients and salinity gradients (EPE, 2018; Santos, 2019). In addition, there are also considerable prospects for the use of *offshore* wind energy, i.e., through turbines located offshore (EPE, 2019).

It is also worth noting that marine renewable energy (EMR) is not only a new perspective for energy production, but also opportunities to foster economic development, job creation, and technological innovation (Mont'alverne and Cavalcante, 2018), in line with global agendas that aim to promote renewable energy and the mitigation of greenhouse gas (GHG) emissions. In this context, it is interesting to mention the possibilities generated by the production of the so-called "green hydrogen" as a renewable energy source. This is a sustainable solution, achieved through a chemical process known as electrolysis, which allows the generation of energy without carbon dioxide emissions. Although it is an incipient and highly complex technology, several companies and countries have invested in this energy source, seen as a promising way to "decarbonize" the planet (Smink, 2021).[25] In Brazil, there are pilot projects underway for the production of green hydrogen in port complexes in different states, such as Ceará (Pecém) and Pernambuco (Suape) (Serpa, 2021).[26]

25. See: <https://bit.ly/3J0iyuR>.

26. See: <https://bit.ly/3J0iyuR>.

In general, *offshore* wind energy in Brazil has a good potential, especially in the northeastern region, considering geographical and physical characteristics. However, because there is no regulatory framework already established for environmental licensing, for the implementation of enterprises, and for the energy concession model, there is still no exploration of this energy source in Brazil (Matsumura, 2019). It is also worth mentioning that another factor that hinders the exploration of this energy source in Brazil is the absence in the country of a consolidated *Marine Spatial Planning* (MSP) – a fundamental instrument for the management of activities developed at sea, as will be discussed in greater depth in the next section of this text.[27] However, it should be noted that the regulation[28] for the installation of offshore wind farms is under discussion in the National Congress[29] and the industry is preparing to start operations.

In an attempt to minimize the negative effects of the absence of a specific regulatory framework on the subject and to offer some legal security to entrepreneurs interested in investing in this area in the country, IBAMA prepared in 2020 a Standard Term of Reference for the Environmental Licensing of Offshore Complexes (IBAMA, 2020). Currently, there are already several projects applying for environmental licenses with IBAMA, highlighting the following: i) Asa Branca I Maritime Wind Complex, with an expected potential of 400 MW, composed of 50 turbines, located in Ceará and managed by the company Eólica Brasil; ii) Caucaia Wind Complex, with an expected potential of 416 MW, composed of 59 turbines, also located in Ceará and managed by the company BI Energia; and iii) EOL Offshore Wind Generation Pilot Plant, with a potential of approximately 5 MW, composed of one turbine, located in Rio Grande do Norte and managed by Petrobras (EPE, 2018; Três..., 2018).

Although there is room for growth, the exploration of the seas as an energy source is still incipient in the country, being carried out from prototypes that use wave and tidal energy, for example, in the scope of projects linked to universities and research centers. Tidal[30] energy, generated by means of tidal power, stands out for being renewable, non-polluting, and predictable – in

27. See: <https://bit.ly/3mnM97C>.

28. Decree No. 10.946/2022, which provides about the assignment of use of physical spaces and the use of natural resources in inland waters under the Union's domain, in the territorial sea, in the exclusive economic zone and on the continental shelf for the generation of electricity from offshore venture. Available at: <https://bit.ly/3KZqiNR>.

29. In February 2021, Bill No. 576/2021 was filed, with the purpose of regulating the authorization of energy generation undertakings on the Brazilian coast – wind, solar and tidal.

30. It is worth mentioning the wave power plant project developed by the Alberto Luiz Coimbra Institute for Graduate Studies and Research in Engineering at the Federal University of Rio de Janeiro (Coppe/UFRJ), whose tests began in 2012 in the port of Pecém (Ceará), having been the first initiative of its kind in Brazil (Guerra, 2020). See: <https://bit.ly/3yBCHm4>.

other words, clean energy to be exploited. However, even though this type of energy does not use fossil fuels or generate waste to the environment, the installation of tidal power plants may cause serious environmental impacts, so their application requires careful studies (AFP, 2019).

Besides tidal power, the possibilities of energy generated from the sea also include energy from waves (omnomotive power), from underwater turbines driven by marine currents and the temperature difference between deep and shallow waters. In this sense, it is worth noting that the National Policy of Marine Resources, in its article 3, establishes the use of energy resources derived from winds, tides, waves, currents and temperature gradients. After evaluating the theoretical potential of Brazilian ocean energy, particularly tidal and wave energy, it is estimated that the country can generate about 114 GW on its coast (Seahorse Wave Energy, 2013).

Considering that this is a preliminary evaluation, it is necessary to emphasize the importance of more in-depth studies on the subject. The lack of detailed data on the potential of *offshore* energy in Brazil hinders more detailed analysis and studies on the technical and economic feasibility of the activity, hindering the proper planning of public policies. In view of its high cost, the Ten Year Energy Expansion Plan (PDE) 2019-2029 foresaw that only in 2027 would there be the prospect of implementing this type of technology in Brazil.

It should be noted, however, that by May 2021 there were twenty environmental licensing processes open with IBAMA, requesting the installation of *offshore* wind complexes in Brazil. Thus, it becomes necessary to continue the studies recently published on the subject in Brazil (Vinhoza and Schaeffer, 2021; Hernandez et al., 2021), in order to consolidate results about the energy potential arising at sea and, consequently, the possible contributions of the energy sector not only for the national energy matrix, but also with an eye to the blue economy and the Brazilian Sea GDP.

2.3 Fishing and aquaculture

The fishing activity in Brazil is governed by Law No. 11,959 of June 29, 2009, an instrument that provides the National Policy for the Sustainable Development of Aquaculture and Fishing. Among the competencies of the Secretariat of Aquaculture and Fishing, the agency responsible for the fishing order[31] in the country and subordinated to the Ministry of Agriculture, Livestock, and Supply (MAPA), the management of resources, research, licensing, permits, registrations, and authorizations related to the activity in Brazil stand out. It also highlights the division of national

31. Fisheries planning consists of the set of rules and initiatives that allow the management of fishing activity, based on the knowledge of its biological, ecosystem, economic and social components (Brazil, 2019).

fishing in the following categories: i) artisanal; ii) industrial; iii) scientific; iv) amateur; and v) subsistence (Brasil, 2019).

There is, in general, a tendency of growth in the number of jobs in this sector in Brazil, especially in adjacent activities, such as commerce. Several specialists and organizations point to the absence of official data about the generation of income and the quantification of fishing activities in the country, which makes an accurate measurement of the numbers in this sector difficult – the improvement of databases and measuring methods being, therefore, one of the main challenges and needs for the survey of information about the national fishing sector.

Having already been considered the country with the greatest potential for the development of fishing and aquaculture around the globe (Fogaça, 2020), Brazil currently ranks 13th in the production of fish in captivity and 8th in the production of freshwater fish (op. cit.). In line with other marine and maritime sectors, among the main difficulties for the development of the sector are the lack of collection and systematization of statistics on fishing activity in the country (FAO, 2020; Fogaça, 2020; Mesquita, 2020) and the lack of an integrated and state policy, having, for example, the institution responsible for fisheries administration at the federal level been changed ten times in recent decades (Gonçalves Neto et al., 2021).

The last statistical bulletin on fishing and aquaculture in Brazil with consolidated data was published in 2013, with information for the year 2011. It has been, therefore, ten years without updating official data on the sector, which prevents the proper formulation of public policies based on data (Gonçalves Neto et al., 2021). In this sense, it is worth noting that the country was explicitly mentioned in FAO's 2020 Report on the world state of fisheries and aquaculture for not providing official production data since 2014 (FAO, 2020). Among the available data, it is pointed out that national aquaculture production (including fish, shrimp, oysters, scallops, and mussels) reached 599,000 tons in 2019 – representing a 3.2% growth over the previous year. The sector has shown continuous growth between 3% and 7% in recent years, which may be a reflection of greater professionalization and the intensified use of technologies in the activities (CNA, 2019).

Until 2011, marine extractive fishing followed as the main source of national fish production (38.7%), followed by continental aquaculture (38%), continental extractive fishing (17.4%), and marine aquaculture (6%) (IBAMA, 2011). According to more recent data, among the most produced fish species in Brazil in 2019, tilapia (61.1%) and tambaqui (19.1%) stand out (CNA, 2019). It is also worth pointing out that Brazil registers a total fleet of 65.4 thousand boats, of which 64.4% are powered by rowing and sailing (42,100), and the 35.6% by motor (23,259). The largest number of boats is based in the Northeast (64.9%), followed by the South (14.5%), North (11.5%), and Southeast (9.1%) regions (Dias Neto and Dias, 2015).

The low existence of data in practically the entire decade of 2010 results in the impossibility of a sustainable management of the fishing activity in the country, compromising, for example, the efforts to preserve living resources and to combat predatory fishing – in addition to aspects directly related to food security (Menegassi, 2020). Among other challenges that are imposed on the management of the fishing sector, illegal, unreported, and unregulated fishing (IUU fishing) stands out, also causing serious impacts on marine biodiversity. The presence of illegal foreign vessels has been increasing in the South Atlantic, resulting in several episodes of approach, seizure, persecution and even sinking of these vessels – as in a case that occurred off the coast of Argentina (Mesquita, 2020).

In international waters, however, near the Brazilian coast there have been frequent incidents. For example, in 2018 a fishing vessel from Rio Grande do Norte was hit by a Chinese fishing boat and in March 2020, a vessel was seized by the Brazilian Navy with 15 Venezuelans and three tons of illegal fish off the coast of Amapá. Such episodes reinforce, above all, the need for better monitoring of AJB – which highlights the importance of surveillance and monitoring instruments such as the Blue Amazon Management System (SisGAAz) and the National Program for Tracking Fishing Vessels by Satellite (PREPS), both of the Brazilian Navy (Andrade, Rocha and Franco, 2019). It should be reinforced, in this sense, that combating these actions is essential for the exploitation and preservation of living resources and for the protection of the local economy, considering that illegal fishing brings consequences related to the environment, food security and the fishermen themselves who carry out their activities in a regulated manner (Brito, 2020).

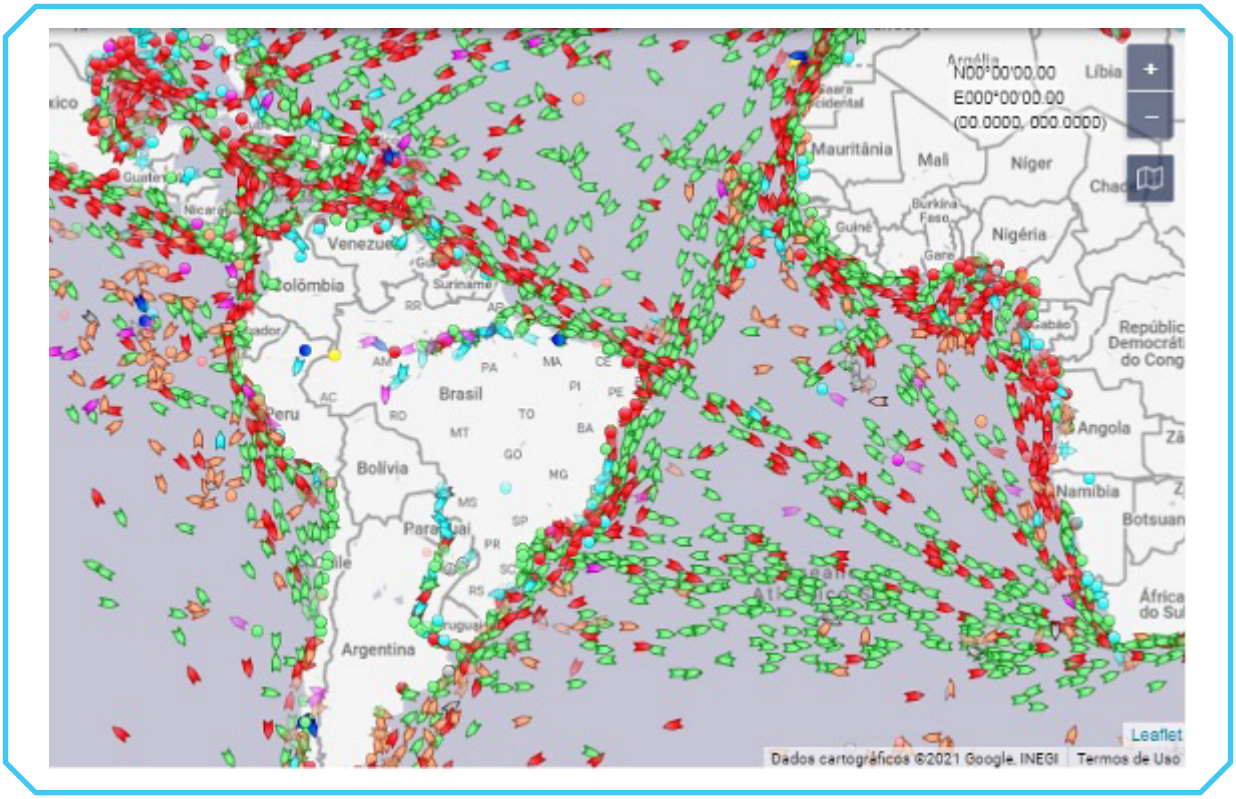
2.4 Transportation

The economic activities related to transportation carried out by sea are prominent in the Brazilian blue economy. The relevance of this sector occurs, in particular, due to the large volume of goods that crosses ports and national waters daily. More than 90% of all Brazilian foreign trade, for example, is transported by sea (Lima Filho, 2021).[32,33] Figure 2 presents the vessel traffic and navigation lines that cross the Blue Amazon and Brazil's strategic surroundings.

32. See: <https://bit.ly/3H4VzwV>.

33. In the Brazilian case, the relevance of transportation and defense in inland waters, particularly in the Amazon, led to the proposal that, "in didactic and conceptual terms, it seems pertinent to separate the Economy of the Sea from the Economy of Waterways, or, on the other hand, to join them into a single category, such as 'Hydric Economy' or 'Economy of the Sea and Rivers'" (Santos and Fontes, 2020, p. 353).

FIGURE 2
Vessel traffic map and navigation lines in the Blue Amazon and in the Brazilian strategic environment (2021)



Source: MarineTraffic, 2021. Available at: <https://bit.ly/3ty5uqF>.
Publisher's note: Figure displayed in low resolution due to the technical characteristics of the original files.

The main transportation activities carried out in the country are: i) cabotage marine transportation; ii) long course marine transportation; iii) support navigation; iv) cross water transportation; v) water transportation not previously specified; vi) marine agency activities; and vii) auxiliary activities of water transportation not previously specified. In addition, the "management of ports and terminals" is also fundamental for the performance of the transport activities mentioned.

Even though cabotage navigation also presents a growth in the number of employees, its potential has not yet been fully utilized. In this sense, a law that determines the Cabotage Stimulation Policy, which creates the program called "*BR do Mar*", is in course in the National Congress. The Law Project 4199/2020,[34] already passed by the House of Representatives and currently in the Federal Senate, aims to increase the supply of cabotage transport services on the coast of

34. This proposition has already been approved and became Law No. 14.301/2022. Available at: <https://bit.ly/3KYIsiE>.

the country, increasing competitiveness among companies offering such services. In addition, the program also aims to encourage the development of the national naval industry, the reduction of costs and the increase of logistical efficiency in maritime transportation in Brazil (Brasil, 2020b).

According to ANTAQ's statistical base,[35] despite the Covid-19 pandemic, in 2020 the national port handling (organized ports + authorized and leased terminals) was 1.151 billion tons (+4.2% compared to 2019). Of this volume, TUPs handled 66.0% and organized ports 34.0%, being 60% dry bulk, 25% liquid bulk, 10% containers and 5% loose general cargo.

Considering the participation of the different ways, in exports the maritime way corresponded to 98.6% in tons and 88.9% in value, while in imports it reached 95.0% and 74.0%, respectively. The ports that handled the most cargo in 2020 were Santos (114.4 MMton), Paranaguá (52.1 MMton) and Itaguaí (45.7 MMton). Among the most moved goods were iron ore (356 MMton), oil and oil products (262 MMton), containers (118 MMton), and soybeans (104 MMton). Among the imported goods (in tons), the most important were fertilizers (24%), petroleum products (14%), and mineral coal (13%).

2.5 Tourism

When it comes to tourism, Brazil stands out for its natural and cultural resources, being the country with the highest level of competitiveness in South America (WEF, 2019). However, despite the country's potential, it is 32nd in a ranking presented in a 2019 report by the World Economic Forum. It is also noteworthy that approximately 90% of tourism spending in Brazil comes from domestic tourism, highlighting the relevance of this niche and the potential that can still be explored from international tourism in the country (WEF, 2019).

Among the characteristic tourist activities of the seashore, there are the so-called "sun and sea tourism", "nautical tourism", "coastal tourism", "beach tourism", "seaside resort tourism" and "coastal tourism", in addition to tourism related to the practice of sports, such as "diving tourism". In general, the tourism sector presents great complexity, given that it involves activities, products and services of the most diverse natures – hospitality, access infrastructures, food, recreation, sporting goods and marinas, for example. Tourism is, therefore, an economic and social activity of great relevance, generating effects throughout its extensive supply chain. It is also essential that the management of this sector occurs from bases of sustainability with regard to aspects of environmental preservation and cultural identity.

35. Available at: <https://bit.ly/36yOBDu>.

The production of more in-depth information that is closer to reality in the tourism sector, focusing on the mapping of sustainable tourism routes, for example, proves to be of great importance for the development of public policies and for the decision-making process – both for public and private agents. In this sense, it is observed that many statistics made available by official agencies need continuous historical series and specific methodologies for the Brazilian reality and the different regional contexts of the country (Brazil, 2019). As there is no systematization of national data, only for the purpose of exemplification, this paper will make a brief examination of the tourism sector in Ceará, a coastal state in which tourism has historically shown great relevance.

Tourism in Ceará has grown significantly in recent years, contributing directly to job generation and to the population's income level. Between 2010 and 2019, the flow of tourists in the state jumped from approximately 2.6 million to more than 3.7 million visitors (a variation of 37.8%) – a reflection of an effort for a greater structuring of the sector. In the same sense, the participation of the income generated by tourism in the state's GDP went from 10.3% to 12.69%. In terms of market segmentation, the motivations of tourists are divided mainly between leisure travel (45.4%), visiting relatives and friends (19.8%), business and work (18.4%), and events (12.3%) (Estado do Ceará, 2020). Table 1 presents more information regarding the tourist demand for Ceará, taking as a filter the arrival in the state via Fortaleza.

TABLE 1

Tourist demand in Ceará via Fortaleza, according to main motivation (2019)

Motivation	Tourists		Perm. (days)	Expenditures (R$)		Tourist revenue		Impact on GDP (%)
	Total	%		Per capita	Per capita/ day	R$ million	%	
Leisure/sightseeing	**1,683,805**	45.4	12.87	3,288.43	255.51	5,537.1	47.2	5.9
Visiting relative/friend	**734,347**	19.8	10.48	3,265.71	311.61	2,398.2	20.4	2.6
Business/work	**682,423**	18.4	6.91	3,108.95	449.92	2,121.6	18.1	2.3
Congresses/events	**456,185**	12.3	4.98	3,258.88	654.39	1,486.7	12.7	1.6
Other	**152,062**	4.1	11.89	2,995.19	251.91	201.7	1.7	0.2
Total	**3,708,821**	**100.0**	**9.43**	**3,165.28**	**335.80**	**11,739.5**	**100.0**	**12.6**

Source: Estado do Ceará (2020).

Obs.: 1. Impact on GDP is obtained by the relationship between Total Tourist Revenue (Direct and Indirect) and GDP.

2. Direct Revenue is obtained by the product between Per capita Expenditure and Tourist Demand via Fortaleza.

3. Total Tourist Revenue (direct + indirect) or Income Generated, stems from the interactive process of tourist spending in the economy via the marginal propensity to consume (multiplier effect).

4. The multiplier of tourist expenditures used was 1996 = 1.34, 1997 = 1.43, 1998 = 1.53, 1999 = 1.64 and 2000 to 2004 = 1.75 (Ferreira and Oliveira, 1996).

5. GDP cf(2007 to 2010) estimated by Ipece/CE.

The data presented in table 1 point to the importance of systematizing information and data related to the tourism sector, with the objective of promoting specific actions for its strengthening. In this sense, it is worth emphasizing the relevance of the actions of regional bodies, in coordination with federal instances, for monitoring the tourist flow in the states and municipalities. In this sense, considering the multi-sectoriality of the tourist activities, it is important that the numbers of the sector are measured, in order to direct efforts towards public policies that optimize and use in a sustainable way the potential of the coastal coast for such activities.

According to the tourism statistical yearbook 2020 (base year 2019), only 0.4% of formal occupations in national tourism are related to water transport. Between 2018 and 2019, there was an increase in tourist arrivals by sea (+16,534) and by river (+3,832), corresponding respectively to 1.9% and 1.6% of the total. The flows of January and February stand out (including December, in the case of waterway transport).

According to CLIA and FGV (2020), the results of the 2019/2020 season compared to the 2018/2019 season were, for shipowners:

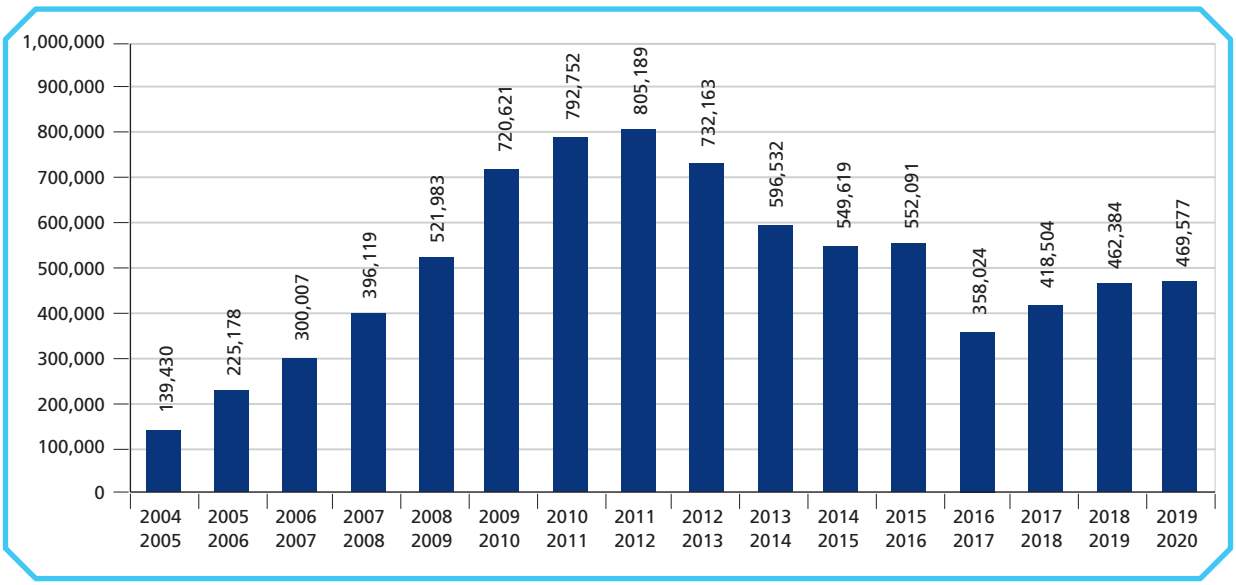
- fuel: R$ 565.0 MM (+33.6%);
- food and beverage suppliers: R$ 221.5 MM (-7.6%);
- fees and taxes: R$ 157.4 MM (-2.1%);
- commissioning for branch operators: R$ 74.5 MM (-9.0%);
- marketing, tours and offices: R$ 56.7 MM (+41.4%);
- water and garbage: R$ 29.2 MM (-2.3%);
- salaries paid: R$ 26.3 MM (+12.9%);
- retail trade: R$ 335.2 MM (+1.7%);
- food and beverage: R$ 333.4 MM (+2.6%);
- transportation before and/or after the trip: R$ 177.8 MM (+1.1%);
- tours: R$ 146.0 MM (+3.6%);

- transportation during the trip: R$ 71.3 MM (+3.2%); and
- lodging before and/or after the cruise: R$ 46.4 MM (+6.2%).

Also according to the same report, "since the 2011/2012 season the number of ships in the Brazilian cabotage season started to decrease, until reaching a plateau of 7 ships in 2016/2017, a number that was maintained until the 2018/2019 season" (CLIA and FGV, 2020). However, in the 2019/2020 season, the number of ships increased again to 8 vessels.

CHART 2

Number of cruisers embarked



Source: Cruise Lines International Association (CLIA) Brasil.

Without a doubt, the tourism sector in general has been one of the hardest hit by the Covid-19 pandemic. Thus, it will come as no surprise that it will fall in the years 2020 and 2021. However, it is worth pointing out that, precisely because of the period of social isolation experienced in Brazil and in the world, it corresponds to one of the sectors with the greatest capacity for immediate growth. It is also worth highlighting its relevance in terms of job creation (formal and informal), as well as its relationship with related sectors, such as hospitality, services, and culture.

2.6 Marine industry

The naval industry represents a sector of economic importance for the development of countries around the world. In this context, the high factor of multiplication provided throughout its production chain is a determining factor, requiring the integration of various sectors of the economy

(Lima Junior, 2004). The recent advances in oil and natural gas exploration in the country, as pointed out in the previous section, have made the *offshore* segment a highly relevant market for the national naval industry. In this regard, the construction of drill ships, production platforms and marine support vessels, and subsea engineering[36] stand out.

Recently, the naval industry has received different orders from the oil and gas sector, generating expectations of growth and resulting in the construction of new shipyards in the country. However, it should be noted that the naval and *offshore* industry still lacks development to keep up with the evolution of the offshore exploration sector and to meet the growing national demand (Virgulino, 2020), which also comes from new ventures related to renewable energy and fiber optic submarine cables, as pointed out throughout this work.

Regarding the naval industry in Brazil, the main activities performed in the national territory are: i) construction of ships and floating structures; ii) construction of ships for sport and leisure; and iii) maintenance and repair of ships.

There has been a great growth in the naval industry in the country in recent years. In addition to civilian orders, the sector has also benefited from military orders, in the context of the renovation of vessels for the Brazilian Navy. In this sense, one can consider specific segments of the Defense Industrial Base (BID) as part of the national blue economy, so that the defense sector contributes not only to technological and industrial development, but also to the presence, protection and preservation of the waters of the Blue Amazon.

In the scope of Defense projects for the reequipment and acquisition of new means of action, the Defense Articulation and Equipment Plan (PAED) stands out. In this regard, with regard to the naval industry, the Strategic Program called "Construction of the Naval Power Core" must be highlighted. This program is divided into specific subprograms, such as the Submarine Development Program (PROSUB) and the Program for the Procurement of Surface Resources (PROSUPER), which includes the procurement of Tamandaré Class Ships, whose construction and incorporation to the Naval Force should extend until 2028 (Brazilian Navy, 2019).

The PROSUB, in turn, is an initiative that aims to build four conventional submarines and one nuclear-powered submarine, as well as a Shipyard and Naval Base (EBN). Considering its emphasis on the nationalization of components, it is the largest program of scientific-technological training of the Brazilian defense industry, also noting a great contribution to the national naval industry (Andrade et al., 2018).

36. Available at: <https://bit.ly/3uyU8SP>.

Data from SINAVAL highlights that total jobs at Brazilian shipyards fell 30.8% between 2014 and 2015, reaching only 57,048 jobs (a figure simulating that of 2010). Between 2015 and June 2016 (latest data available), the figure fell another 23.3%, reaching only 43,745 jobs.[37] It is evident that the economic and political crisis that Brazil has experienced since 2014 has affected this industry, including the emblematic case of Rio Grande (D'Ávila and Bridi, 2017).

Regarding the perspectives for the Brazilian naval industry, it should be noted that it has been quite affected due to the Covid-19 pandemic and, also, due to the devaluation of the Brazilian exchange rate. In 2020, the discussion about the Bill 4.199/2020 (BR do Mar) was highlighted. Despite the focus on cabotage, the proposal of its untying from the naval industry has been understood as a disincentive to the national naval sector.

In the State of Rio de Janeiro, the Naval Technology Cluster (CTN-RJ) stands out, created in the second half of 2019 and aims to regain economic momentum through different business opportunities in the region. With AMAZUL, CONDOR, EMGEPRON and NUCLEP as founding companies, the CTN-RJ seeks to stimulate above all the naval sector and other related ones in the promotion of regional economic development.

3 NATIONAL PUBLIC POLICIES AND INITIATIVES FOR THE SUSTAINABLE USE OF THE SEA'S POTENTIAL

The National Policy for the Resources of the Sea (PNRM) is the main national instrument that provides for the sustainable use of the sea. Its purpose is to guide the development of activities aimed at the effective use, exploration, and exploitation of the living, mineral, and energy resources of the marine space in a sustainable manner. The activities and resources foreseen in art. 3 of the PNRM and that must be submitted to an integrated approach are: fishing, biodiversity, minerals, energy resources, aquaculture, and tourism. Note that the PNRM does not include the activity of maritime cargo transport, which is "subject to specific policies and legal norms".

With a broader scope, the National Maritime Policy (PMN) seeks to contemplate all issues related to the use of marine space. However, the most recent version was approved by Decree 1.265, October 11, 1994, and more than 25 years have passed since its promulgation. In order to cover the document's gaps – originated from structural changes both domestically and internationally – the Federal Government established an Interministerial Working Group (GTI) to update the instrument (Brasil, 2021). Created by Decree No. 10.607, of January 22, 2021, the GTI aims to

37. See: <https://bit.ly/3svdRTI>.

update the PMN taking into consideration aspects related to the prospects of the Blue Economy and the growing territorialization of the oceans.[38]

The elaboration of a new PMN goes through different expedients related to the sustainable exploitation of the potential of the Blue Amazon. However, it should be noted that there are, in this context, complex challenges to be overcome, highlighting the multisystemic nature of this initiative.[39] Necessary steps for the proposition of public policies, the identification of problems and the definition of priorities require the participation not only of public agencies,[40] but also of civil society, through Academia, the productive sector, and even local populations. It is also important to emphasize the importance of a systemic and integrated look at the national maritime sector, providing an appropriate treatment of issues related to the various sectors of the economy related to the sea and the establishment of sustainable governance, including as a goal in international commitments made by Brazil (Silva, M., 2021).

With an expected duration of one year, which can be extended for the same period, the GTI will present, at the end, a report that should include the procedures for the implementation of the new PMN. The initiative brings, therefore, an important and necessary perspective of integration of the various public policies and sectorial legislations that already exist in the country, enabling a harmonious treatment of the theme and directly contributing to the efforts undertaken nationally in the scope of the Blue Economy.

The Interministerial Commission for Marine Resources (CIRM), created in 1974, is responsible for the integration of different sectors related to the marine environment. The organ has the purpose of "orienting and coordinating the actions related to the accomplishment of PNRM", besides "implementing and planning the execution of the Brazilian Antarctic Program (PROANTAR)"[41] and "approving the National Coastal Management Plan (PNGC)". The analysis of its instruments indicates that the agency contemplates policies related, in general, to defense, navigation, and living and non-living resources.

38. See: <https://bit.ly/3pgBptR>.

39. Available at: <https://bit.ly/3GQcPpt>.

40. The following agencies make up the GTI: Navy Command (responsible for coordinating the work), Advocacy General of the Union, and the Ministries of Justice and Public Security, Defense, Foreign Affairs, Economy, Infrastructure, Agriculture, Livestock and Supply, Citizenship, Health, Mines and Energy, Science, Technology and Innovations, Environment, Tourism and Regional Development.

41. Launched in 1982, the Brazilian Antarctic Program – PROANTAR has strengthened the presence of Brazilian science in Antarctica, which completes forty years of activities in that Continent (Câmara et al., 2020).

Consisting of an inter-ministerial committee, CIRM is currently composed of the following ministries: Defense; Foreign Affairs; Infrastructure; Agriculture, Livestock and Supply; Education; Health; Mines and Energy; Economy; Science, Technology and Innovation; Environment; Citizenship; Tourism; and Regional Development. The Civil House of the Presidency of the Republic and the Navy Command also participate in the CIRM.[42] In this sense, it is interesting to highlight that the Navy Commander is designated the country's Maritime Authority, being the Coordinator of CIRM – which reinforces the relevant role of the Brazilian Navy regarding the Blue Amazon (Barros-Platiau, Sondergaard and Prantl, 2019).

The X Sectorial Plan for Marine Resources (PSRM) (2020-2023), a document elaborated in the scope of the CIRM, has eleven actions – i) scientific research in oceanic islands (PROILHAS); ii) assessment, monitoring and conservation of marine biodiversity (REVIMAR); iii) aquaculture and fishing (AQUIPESCA); iv) marine biotechnology (BIOTECMARINHA); v) assessment of the mineral potential of the Brazilian continental shelf (REMPLAC); vi) prospection and exploration of mineral resources in the international area of the South and Equatorial Atlantic (PROAREA); vii) Brazilian System for Ocean Observation and Climate Studies (GOOS-BRASIL); viii) human resource training in marine sciences (PPG-MAR); ix) Marine Space Planning (PEM); x) development and sustainable use of the Blue Amazon (PRO Amazônia Azul); and xi) promotion of the maritime mentality (PROMAR).

It is noted that among the actions listed in the X PSRM, only REVIMAR is coordinated by the Ministry of the Environment (MMA) and is related to the conservation of marine biodiversity. The other actions are coordinated by the Brazilian Navy (PROILHAS, GOOS-BRASIL, PEM, PRO Amazônia Azul and PROMAR) and by other Ministries – the Ministry of Science, Technology, Innovation and Communications (MCTIC) is responsible for the action called BIOTECMARINHA, the Ministry of Agriculture, Livestock and Supply (MAPA) by AQUIPESCA; the Ministry of Mines and Energy (MME) by REMPLAC; the Ministry of Foreign Affairs (MRE) by PROAREA and the Ministry of Education (MEC) by PPG-MAR.

In the scenario presented, each productive sector should report to specific Ministries and agencies. Oil, gas, minerals, and energy exploration activities should refer to the coordinates of the Ministry of Mines and Energy (MME); fishing and aquaculture activities to the Aquaculture and Fishing Secretariat (SAP/MAPA); tourism activities to the Ministry of Tourism; port activities and navigation to the Ministry of Infrastructure; and the preservation and conservation of the marine and coastal environment to the Ministry of Environment (MMA).

Although the MMA has several competencies, such as monitoring the environmental impact assessments and carrying out, through IBAMA, the concession of licenses for large enterprises and activities that are located in the marine environment, it is not a central organ in the integration

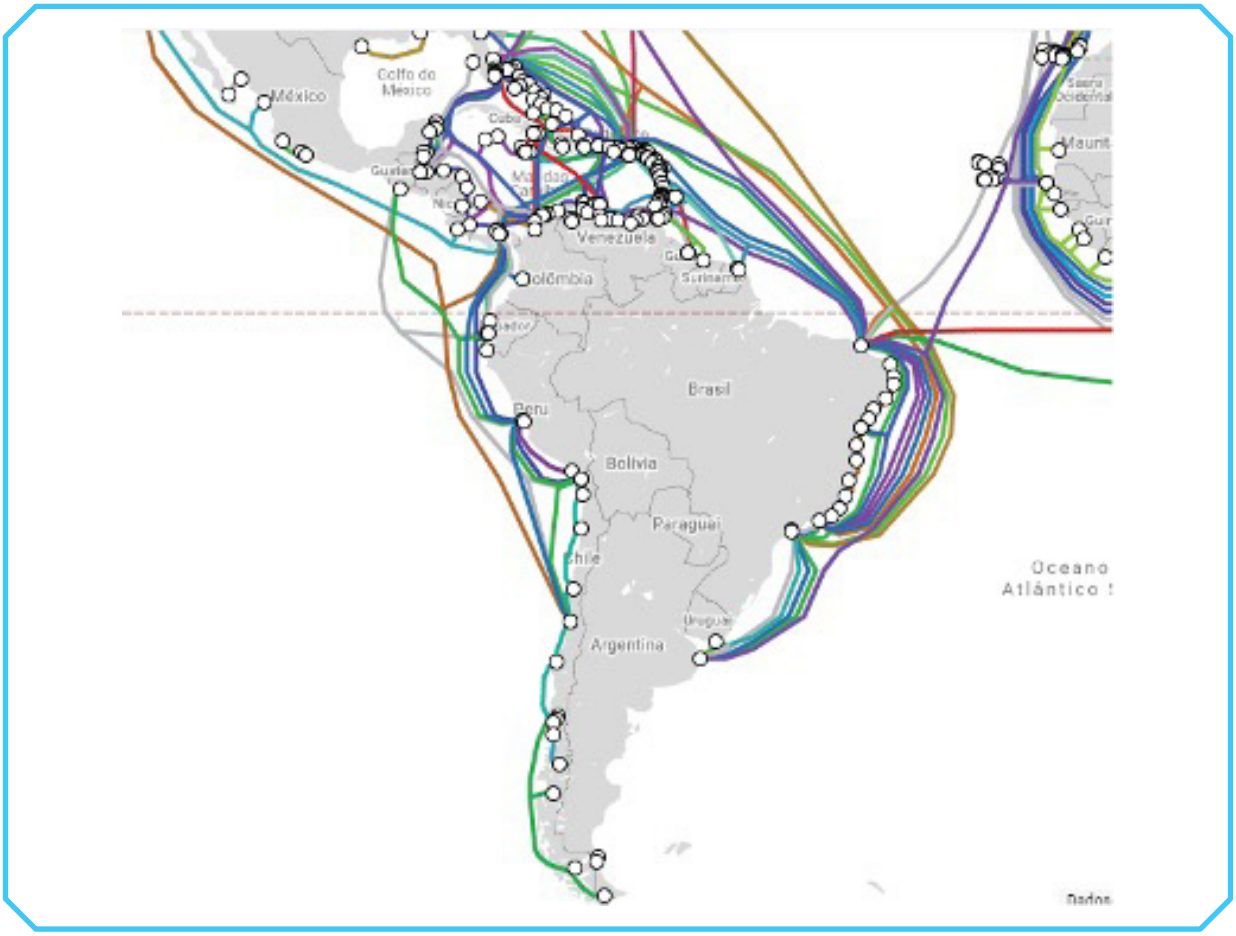
42. See: <https://bit.ly/3J6Yirq>.

and coordination of the different sectors. Therefore, the management of living and non-living marine resources is treated separately, and there is a lack of intersectoral communication between them, and thus no integration of a single policy for marine resources. The interdependence character makes the sustainability perspective imperative, since the use of marine resources by a sector related to the blue economy directly depends on the sustainable use by other actors (European Commission, 2021).

Besides the natural resources present in the Blue Amazon, it is worth mentioning the passage of several submarine cables in the region. It should be noted that this technology is fundamental to the country's ability to communicate with other countries, so that its relevance reaches the most diverse economic and social chains (Vichi, Pinto and Sá, 2020). In general, the flow of information around the globe occurs through submarine cables – including the transport of digital data, telephone and internet – making them part of the national critical infrastructure and requiring great attention to their protection. Figure 3 shows the main connections existing through these cables located in Brazil's maritime territory.

FIGURE 3

Submarine cables in Brazil and their connections



Source: Submarine Cable Map, 2021. Available at: <https://bit.ly/3mm6HgU>.

Regarding the implementation of submarine cables, it is worth emphasizing Brazil's participation in different initiatives. In January 2021, for example, the first fiber optic submarine cable linking Brazil directly to Europe was inaugurated – connecting the city of Fortaleza to Sines (Portugal). Financed jointly by Brazil, the European Commission and EllaLink – the multinational company responsible for the project and its operationalization – the system allows a reduction of up to 50% in latency (response time in data transmission). Considering that the connection between the South American and European continents, until now, was only made via the United States, the venture is of strategic and scientific importance, besides allowing greater exchange between research institutions in South America and Europe (Cabo…, 2021; Ellalink..., 2021).[43]

In another important initiative, Brazil joined, in May 2021, the project to develop the Humboldt submarine cable, which will connect Chile to Australia. In addition to the direct connection between South America and Oceania, the cable will connect from Australia to other cables arriving from Asia, thus increasing the efficiency of the connection between the three continents (Bucco, 2021). The expansion of digital infrastructure through submarine cables is a strategic action for Brazil, since it contributes to increasing the redundancy of the Brazilian connection with the rest of the world and, consequently, to the capacity of data transmission and the country's security (Brasil…, 2021a).

Considering not only the existence of natural resources in the Blue Amazon, but also the critical infrastructures located in the region, it is fundamental to understand the initiatives with the purpose of protecting and monitoring Brazilian Jurisdictional Waters. In this sense, it is worth highlighting the relevance of the Blue Amazon Management System (SisGAAz), a strategic program of the Brazilian Navy whose purpose is to "monitor and control, in an integrated manner, beyond the area affected to the Blue Amazon (...) and the other areas of strategic interest in the South Atlantic (...) in order to contribute to the strategic mobility" of the country, which can be "represented by the ability to respond promptly to any threat, aggression or illegality" (Andrade, Rocha and Franco, 2019).[44]

By integrating different equipment and systems composed of high-resolution radars and cameras, SisGAAz also contributes to the development of technological capabilities in Brazil, benefiting, throughout its processes, society and industry in the country. With regard to the protection of the Blue Amazon, SisGAAz is fundamental to guarantee Brazilian sovereignty, allowing the monitoring of activities carried out in Brazilian maritime territory and preventing the presence of illegal vessels in the region. In April 2021, Brazil joined the international initiative called *Blue Justice*, which

43. See: <https://bit.ly/3GWbEEO>.

44. See: <https://bit.ly/3J6SpKM>.

aims to combat organized crime in the fishing industry, such as illegal fishing, tariff fraud, money laundering, and trafficking. By signing the Copenhagen Declaration, the country became the 34th member of the initiative, led by the Norwegian government and the United Nations Development Program (UNDP). Since fishing is an activity that often goes beyond national jurisdictions and moves to the high seas, cooperation efforts must occur in an integrated context, with actors at regional, national, and international levels (Brasil..., 2021b).[45,46]

It is also worth noting the serious effects that accidents, crimes, and environmental disasters can cause on the economic chain of the sea. In late August 2019, for example, oil slicks were spotted on the Brazilian coast, affecting the country's coastal strip and directly affecting several ecosystems and the local economy (Pena et al., 2020).[47]

Although other episodes of far-reaching marine oil pollution have occurred previously around the globe, such as in the Gulf of Mexico in 2010 after the Deepwater Horizon platform explosion and in Brazil in Guanabara Bay in 2000 after a Petrobras pipeline rupture, it should be noted that the 2019 and 2020 oil spill off the Brazilian coast is considered the largest environmental disaster ever recorded in Brazil and the most extensive oil spill found in tropical oceans (Soares et al., 2020). In this episode the first spots were spotted on beaches in Paraíba, soon being recorded in other regions as well. In total, the nine Northeastern states – Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, and Sergipe – and two Southeastern states – Espírito Santo and Rio de Janeiro – were affected, reaching almost 3,000 km of coastline.[48] Figure 4 shows the evolution of the identified slicks throughout 2019 and table 2 presents the impact of the spill on each federation unit.

45. Available at: <https://bit.ly/3yAJPPs>.

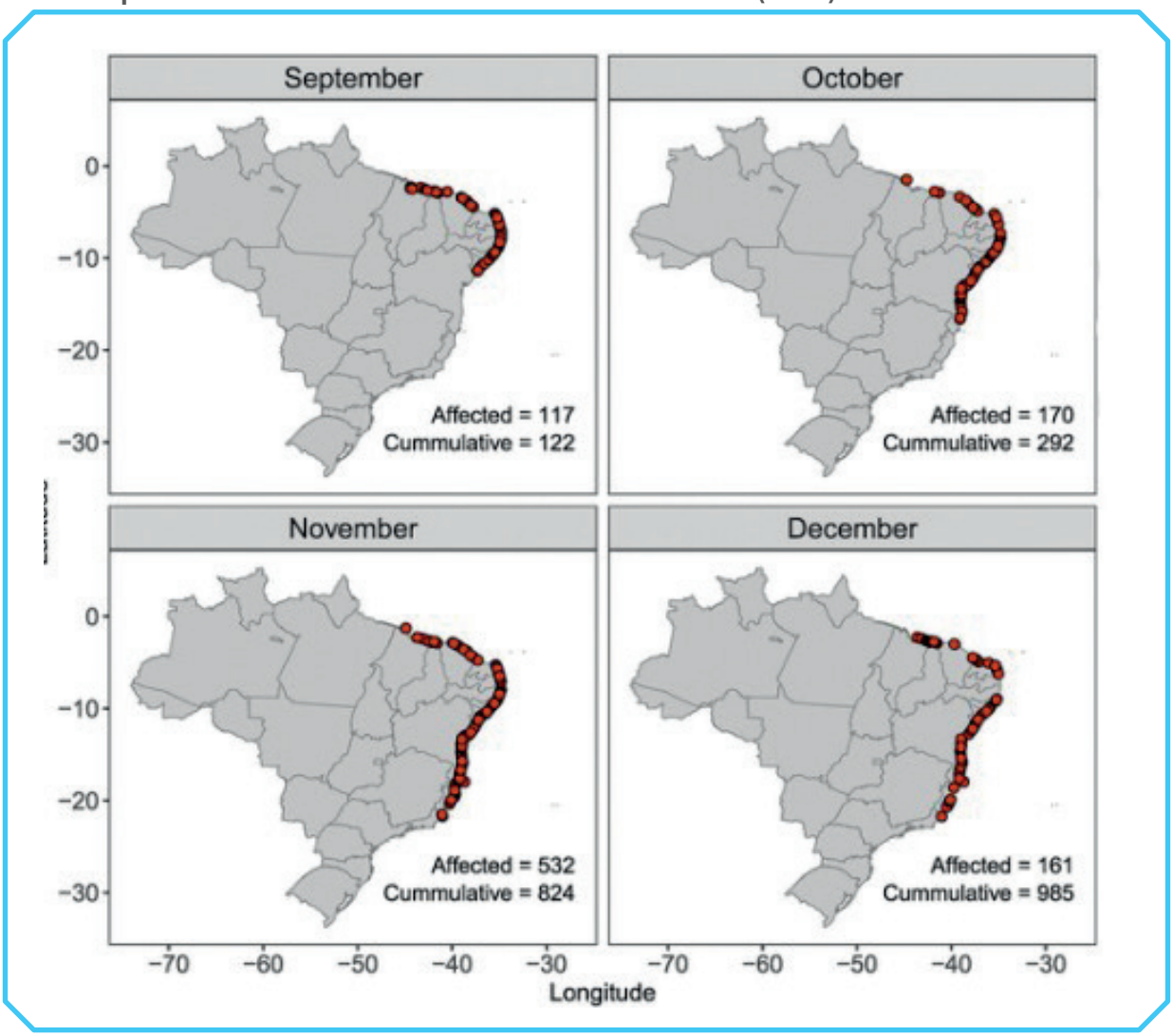
46. It is also noteworthy that *Blue Justice* contributes directly to the Sustainable Development Goals of the United Nations, particularly with regard to SDG 14 ("Life on Water") and SDG 16 ("Peace, Justice, and Effective Institutions").

47. Plastic marine pollution is also a serious environmental problem, resulting in damage to the blue economy and potentially having negative impacts on sea related activities such as tourism, shipping, and fishing.

48. About 99.8% of the oil was recorded in the Northeastern states of Brazil, this being the region mostly affected by the episode (Soares et al., 2020).

FIGURE 4

Temporal evolution of oil slicks on the Brazilian coast (2019)



Source: Soares et al. (2020).

Publisher's note: Figure displayed in low resolution and whose layout and texts could not be formatted and proofread due to the technical characteristics of the original files.

TABLE 2
Impact of the oil spill on each federation unit (UF)

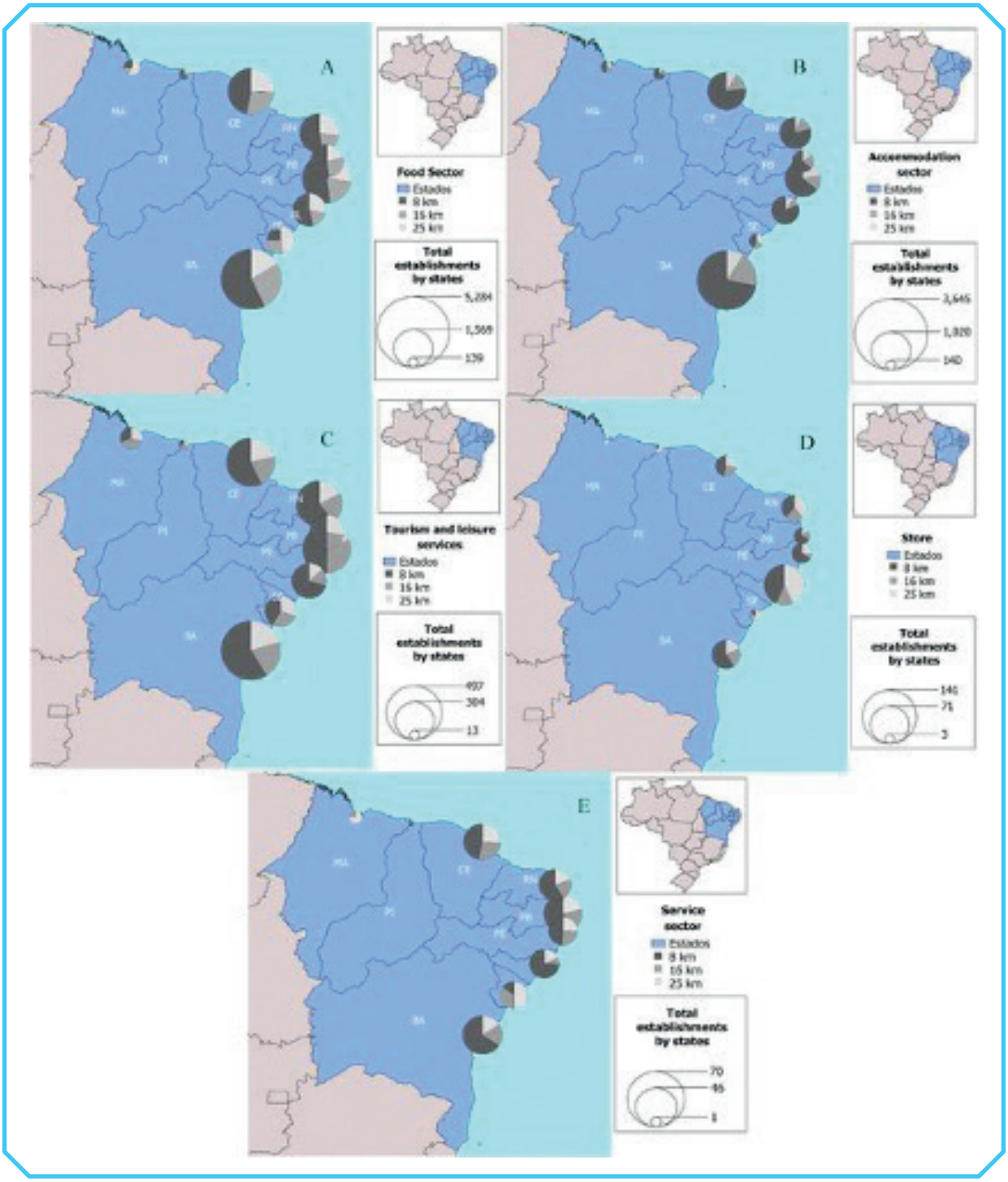
UF	Tons of oil collected	Percentage of oil collected (%)	Affected conservation units
Alagoas	2,564.58	47.67	4
Pernambuco	1,676.26	31.16	7
Sergipe	569.35	10.58	2
Bahia	459.49	8.54	15
Ceará	39.76	0.74	8
Rio Grande do Norte	35.18	0.65	4
Maranhão	13.69	0.25	5
Piauí	10.46	0.19	1
Espírito Santo	6.26	0.12	5
Offshore	3.88	0.07	-
Paraíba	0.85	0.02	5
Rio de Janeiro	0.01	-	1

Source: Soares et al. (2020).

The social and economic consequences caused by the oil spill on the Brazilian coast were also extensive, especially for populations of greater economic vulnerability. The oil spills impacted about 724 fishing and seafood extraction territories along the Brazilian coast, putting at risk the health of 144,000 artisanal fishermen in the northeast of the country alone (Derramamento…, 2020). Besides the fishing sector, the episode also affected the tourism sector, as well as traders, peddlers, and informal workers, resulting in severe environmental, economic, and health damage (Pena et al., 2020). Figure 5 shows the level of socioeconomic vulnerability of different sectors in relation to the negative impacts caused by the oil spill on the coast of the country.

FIGURE 5

Socioeconomic vulnerability of sectors in the context of oil spills in the Brazilian coast (by state)



Source: Pena et al. (2020).

Publisher's note: Figure displayed in low resolution and whose layout and texts could not be formatted and proofread due to the technical characteristics of the original files.

It is observed, therefore, that the adequate monitoring of the Blue Amazon is essential not only to guarantee the sovereignty of the country, but also to ensure that the national economy, the environment and Brazilian society are not harmed by catastrophic episodes such as this. The implementation of SisGAAz in its fullness, therefore, is essential for the protection and sustainable use of the Brazilian sea.

In a relevant initiative that took place on July 30th 2020, during the CIRM session, the Working Group (WG) "GDP of the Sea" was established. By establishing an officially recognized methodology for calculating the GDP of the Sea, the initiative aims to quantify, in a methodical, uniform, continuous and permanent way, the value generated by the sum of activities related to the sea in the country (CIRM, 2020). However, as noted, it is necessary to first establish a national concept for the Blue Economy and identify, examine and classify the sectors that comprise it, as indicated in the instrument that instituted the Group.

Coordinated by the Ministry of Economy, the WG "GDP of the Sea" has the following agencies as members: Ministry of Defense; Ministry of Infrastructure; Ministry of Agriculture, Livestock and Supply; Ministry of Health; Ministry of Mines and Energy (MME); Ministry of Science, Technology and Innovations (MCTIC); Ministry of Environment (MMA); Ministry of Tourism; Ministry of Regional Development; Naval War College (EGN); Secretariat of the Interministerial Commission for the Resources of the Sea (SECIRM); Brazilian Institute of Geography and Statistics (IBGE); National Agency of Waterway Transport (ANTAQ); National Agency of Petroleum, Natural Gas and Biofuels (ANP) (CIRM, 2020).

4 ECONOMY OF THE SEA: WHERE DOES BRAZIL STAND?[49]

The current moment, although restrained by the impacts of the Covid-19 pandemic, is marked by the expansion of industrialization in the ocean, which leads to the recognition that sectors related to the sea are concentrated in continents like Asia and Europe. Therefore, it becomes fundamental to spread the benefits provided by the balanced and sustained development that the economy of the sea can provide to coastal nations. As observed, Brazil has a thriving economy of the sea with great potential for sustainable development.[50]

49. Although the present work proposes to examine aspects of the Brazilian blue economy, the purpose of this section is to present the economic factors related to the national sea and, therefore, concentrates and is structured around the concept of economy of the sea.

50. Although the previous sections refer to the Brazilian blue economy, it is important to emphasize that it encompasses aspects that are largely innovative, generally known as "*Blue economy innovations*", and that are not yet incorporated into the national economy related to the sea. Thus, it becomes even more important to understand where and how Brazil is in relation to the economy of the sea.

The economy of the sea in Brazil includes economic activities that are directly influenced by the sea, including economic activities that do not have the sea as raw material, but are carried out in its vicinity (Carvalho, 2018, p. 24). The approach involves aspects of maritime economic activities (directly related to the sea), while considering the set of economic activities developed (indirectly related to the sea) in Brazilian cities. Throughout this definition, a general approach to the economy of the sea is obtained, agreeing on the geographical and economic characteristics, which has among the coastal states the largest contributors in terms of GDP to the national economy – much of the industrial activity is developed in the cities by the sea.

In comparison with the national economy, the coastal municipalities of Rio de Janeiro stand out in the generation of wealth. It is credited to the great number of municipalities (25) together with the extractive industry and tourism activities, very developed on the Fluminense coast, for the greater weight of these municipalities in the national economy. Another important characteristic is that of the seventy-one Brazilian metropolitan regions,[51] thirteen are located on the coast - Macapá, São Luiz, Parnaíba, Fortaleza, Natal, João Pessoa, Recife, Maceió, Aracaju, Salvador, Vitória, Rio de Janeiro and Florianópolis.

Therefore, the organization of Brazilian society and economic activity, closely associated with municipalities near the coast, or in the coastal municipalities themselves, justify high values of economic and social indicators in sea-related activities. Table 3 presents indicators of the Brazilian sea economy for the years 2015 and 2018.

TABLE 3
GVA, VPB, occupations[1] and compensation in the Brazilian seafood economy (2015 and 2018)

Year	GVA (R$ million)	VBP (R$ million)	Occupations (thousand)	Remunerations (R$ million)
2015	1,184,345	1,990,120	19,829,438	566,003
2018	1,363,288	2,229,517	20,719,091	675,945
%	15	12	4	19

Source: Carvalho (2018); Carvalho and Moraes (2021).
Note: [1] It includes formal and informal workers.

The Brazilian economy of the sea accounted for around 20% of the Brazilian GDP in the years shown in table 3. All indicators showed an increase over the previous year. It is important to highlight that analyzing in terms of GVA, the sectors directly[52] related to the sea with the greatest

51. Number of metropolitan regions obtained through IBGE first half of 2017.
52. Forty economic activities were classified according to CNAE 2.0. More details see Carvalho (2018).

highlights in 2015 were: i) services: mainly the coastal tourism sector; ii) energy, essentially oil and gas; and iii) manufacturing, reflecting the industries of the sea, especially the naval industry. For the year 2018, the Services and Energy sectors remained in the same positions, however, the Defense sector surpassed the manufacturing sector as the third largest GVA among the highlighted sectors, as displayed in table 4.

TABLE 4

Indicators of the main sectors directly related to the sea (2015 and 2018)

Year	Sector	GVA (R$ million)	VBP (R$ million)	Remunerations (R$ million)	Occupations (thousand)
2015	Services (tourism)	96,925.23	125,073.75	14,584.18	1,320,004
	Energy (oil and gas)	77,807.47	123,657.34	14,956.19	48,275
	Manufacturing (industry)	17,422.65	38,471.82	8,762.18	314,593
2018	Services (tourism)	130,543.37	170,393.70	23,752.08	1,731,793
	Energy (oil and gas)	78,776.81	144,840.26	13,226.15	39,204
	Defense	20,898.48	27,181.43	17,936.16	163,695

Source: Carvalho (2018); Carvalho and Moraes (2021).

One can infer from the data pointed out that the Brazilian economy of the sea is dominated by the tourism sector, just like other countries in Europe and Asia. The tourism sector in Brazil is very developed. Brazil has most of its territory with temperatures around 30ºC throughout the year, 13 of the 76 Brazilian metropolitan areas are located on the coast, making the tourist find a developed urban infrastructure. For the energy sector, according to the Ministry of Mines and Energy (2016) *offshore* reserves were most responsible for oil production (6.6% increase) and also gas production (142.5% increase) in the period from 2006 to 2015. The manufacturing sector essentially mirrors shipbuilding and ship repair activities. In the period 2003-2012, these activities were strongly encouraged by public policies, with the oil industry (especially the pre-salt) as the main driver (Carvalho, 2018).

Another important factor to note is that, because we do not have a specific "sea" economic sector in the national accounts, many maritime activities are allocated to sectors such as agriculture and livestock. In this sense, with the proper creation of the "sea sector" and, consequently, the accounting of the main economic indicators – GDP, GVA, GVA, among others – one realizes that the economy of the sea equals the solid Brazilian agricultural sector. This is a primary aspect of the importance of measuring the indicators of the economy of the sea. Only with due knowledge and the correct obtaining of data can public policies be properly formulated and executed. In addition, indicators such as GDP serve to point to the growth of sectors, economies, and nations.

Many of the resources offered by the sea are of concurrent and competing uses, which can cause conflicts. In this sense, Schultz-Zehden et al. (2018), argue that the combination of uses of the sea's resources can reduce the pressure for space, creating opportunities for social and economic development, combining environmental benefits. In this sense, the authors maintain that one of the guiding premises for the sharing of resources from the sea are the advantages provided by the added value, which again answers, the central objective of the work – the importance of measuring the activities related to the sea.

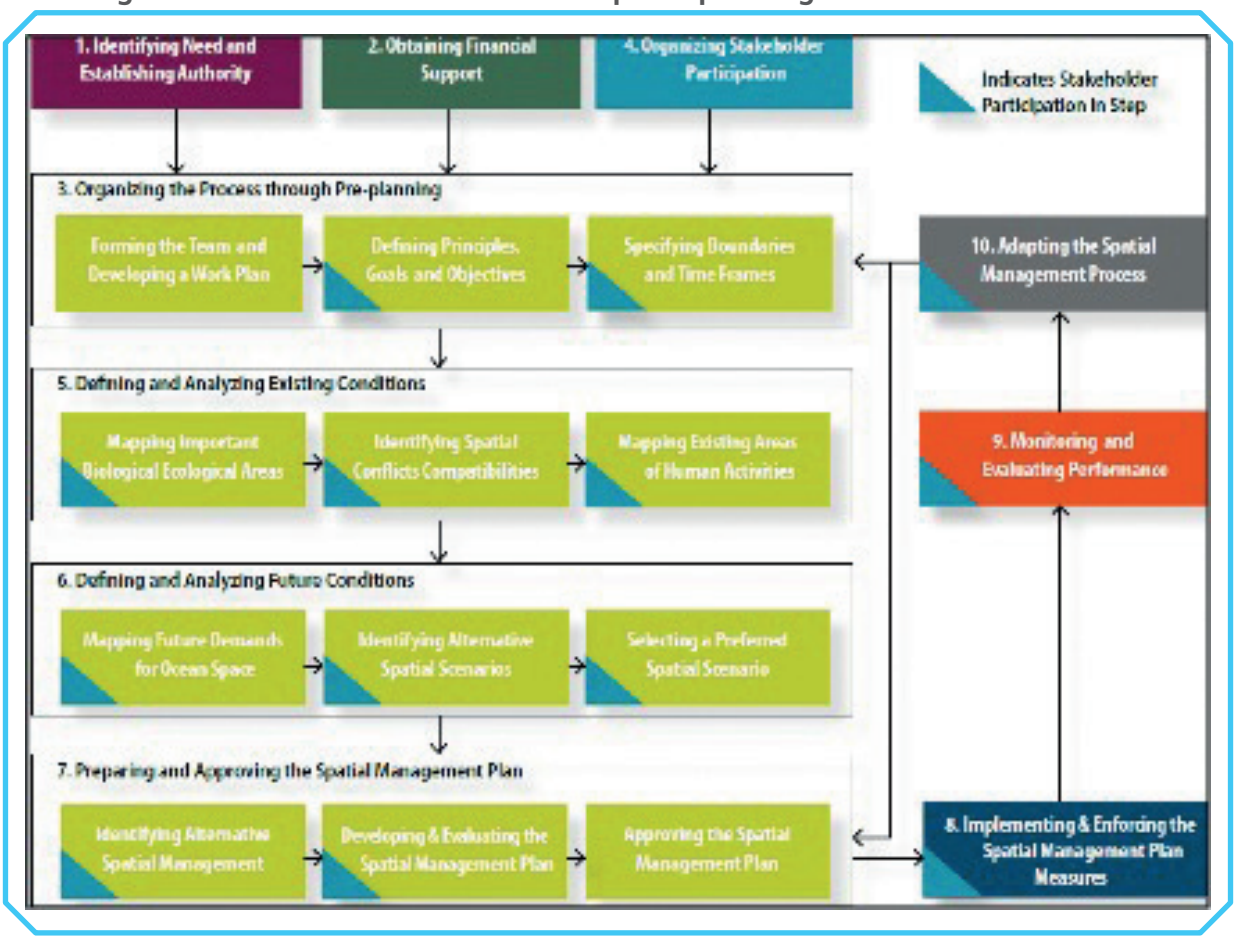
However, to obtain a rational and shared use aiming at a sustainable development, avoiding the creation or potentialization of conflicts – therefore enabling a better use of the economy of the sea – a multifactorial strategic plan is required, and the most widespread is called marine spatial planning (MSP).

The EMP, according to Jones, Lieberknecht and Qiu (2016), is a process of analysis and spatial allocation of anthropogenic activities in marine areas considering ecological, economic and social aspects. Therefore, it aims to specify activities in specific marine areas taking into account, for example, that some activities do not develop appropriately together, as well as environmental preservation areas (APA), among others. Gee et al. (2019) points out that the EMP should elaborate the uses of sea resources in advance, i.e., by identifying existing and potential ones. With this expedient, conflicts can be avoided through a strategic solution addressed within the EMP. A pertinent example of the importance of EMP can be gleaned from Jones, Lieberknecht and Qiu (2016), targeting the energy sector. According to the authors, the benefits of projects correctly focusing on the potentiality and diversification of the sector confer energy security and economic development to the nation. Such a theme is very significant to Brazil today, given the imminent water crisis pointed to the year 2021 affecting the production of electricity in the country.

The EMP is an extremely complex process that involves public and private actors and society. The aspects dealt with in this paper are only tangential to the complexity of the subject, and do not aim at exhausting the discussion. Thus, to illustrate the steps that must be followed in the making of maritime spatial planning, we have the contribution of Ehler and Douvere (2009), in figure 6 below.

FIGURE 6

Stages for the elaboration of maritime spatial planning



Source: Ehler and Douvere (2009).

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It is significant to reaffirm that the EMP is a future-oriented process, thus the maturity of projects and structures already in place in the country and the potential of other uses must be thoroughly analyzed. Gee et al. (2019) point out that once heavy infrastructure is in place, its demobilization becomes difficult in the face of a spatial conflict, so careful precautionary assessments are critical.

Therefore, blue national accounts, i.e. created "sea sector", can and should feed into marine spatial planning, making it a practically applicable framework for managing marine ecosystem services.

5 FINAL CONSIDERATIONS AND RECOMMENDATIONS

Demands on the use of marine resources and maritime activities in general have increased significantly in recent decades. According to the Organization for Economic Cooperation and Development (OECD), oceans currently represent the seventh largest economy in the world, and it has been estimated that this economy could double by 2030 (OECD, 2016). Considering the riches and potential of Brazil's extensive maritime area, it is recommended to systematically measure and monitor the GDP of the Brazilian Sea, aiming to give greater visibility on the subject to the Brazilian society and to subsidize the process of elaboration, implementation, improvement and conduction of public policies, initiatives and appropriate actions related to the country's maritime environment.

From the survey, it was found that the Brazilian State has not yet made official a widely disseminated and systematized methodology for calculating the GDP of the Sea. However, it is worth mentioning the recent creation of the Technical Group "GDP of the Sea" under the Interministerial Commission for Maritime Resources (CIRM) at the end of 2020 as an important initiative. Therefore, it is recommended that joint and integrated efforts be made to qualify, quantify and monitor in a methodical and continuous way the amount generated by activities related to the sea, as well as its percentage in relation to the Brazilian GDP.

Corroborating the relevance of measuring the Brazilian Sea GDP, the need for updated data to support the formulation of public policies and decision-making on the subject was verified. The importance of pertinent information about all the sectors involved is in accordance with the optics of the *data-driven* economy and *data-driven* innovation, concepts explored throughout this work. Thus, the mapping and integrated monitoring of the activities related to the Blue Economy are fundamental, and are, therefore, priority steps for the treatment of the issue in Brazil.

Besides the intrinsic relationship of the economy of coastal municipalities with activities of the sea, it should be noted that the influence of such activities extends to regions near the coast, not limited to those facing the sea (Santos and Fontes, 2020). The development of multidisciplinary studies necessary for a deeper understanding of the Brazilian blue economy and the measurement of the national GDP of the sea will make it possible to know more precisely the potential of the sea even for regional development in Brazil's coastal areas, particularly for the sectors analyzed in this research. From such an understanding, it becomes possible to identify ways to improve the treatment of the activities that make up the sectors related to the sea, resulting in incentives, for example, to those with greater potential to contribute to society.

In the context of the Blue Economy, the lack of greater control over economic actors and their activities ultimately results in the reproduction of patterns that sustain inequality between states. For the regulation of activities based on sustainable aspects, it is necessary, therefore, to understand the risks and how the most vulnerable populations suffer from predatory activities, in order to

seek effective solutions on the subject. In this sense, the integrated vision of the economic sectors related to the seas and oceans must also take into account social and environmental aspects – thus promoting the tripod economy, society and environment, inherent to the idea of sustainability.

Considering the multidisciplinary nature of the areas of knowledge involved, it is recommended that the studies necessary for the expansion of knowledge about the blue economy and the measurement of the GDP of the sea should benefit from a deeper relationship between the State and Academia, as has been happening in countries with high rates of economic, social and technological development. It is fundamental, in this sense, to make efforts to promote the development of a blue growth agenda with integrated strategies, with the purpose of achieving a fairer and more inclusive blue economy.

Especially after the health and economic crisis caused by the SarsCOV2 pandemic (new coronavirus) that affected the entire globe, the stimulus for the development of economic activities focused on the Brazilian sea presents itself as a positive, interesting, and viable agenda that can be added to the different initiatives for the recovery of the economy. Both in the Brazilian case and in other regions, the blue economy can be a vector for the promotion of anti-cyclical policies in the context of post-Covid-19 economic growth, particularly for its impact on the generation of employment, income, product, and taxes.

This paper also presented a brief profile of the Brazilian maritime economy for the years 2015 and 2018. The participation of maritime sectors in the national economy can be understood as a potential indicator of the country's economic dependence on the sea (Kildow and McIlgorm, 2010). In this sense, the authors illustrate that countries with diversified industries and large population tend to have lower shares of the economy of the sea, while less developed economies or small countries tend to show higher contributions from the seas. Thus, it can be inferred that the Brazilian economy presents great economic dependence on the sea.

If the Brazilian sea economy were a country, in the year 2018, it would be the 2nd largest economy in South America. Therefore, it is essential to access and manage efficient and effective policies if the contributions of natural resources are not known. Indicators such as GDP, GVA, salaries, among others, are important and necessary in order to properly exploit the potential of the national economy of the sea. In this way, benefits can be provided: i) environmental – reduction of the negative effects of human activities; ii) economic – fruitful planning of human activities, especially those concerning emerging technologies and their effects; and iii) social – protection of cultural heritage and preservation of social and spiritual values arising from the ocean (Ehler and Douvere, 2009), not exhausting in the examples pointed out. Thus, it is fundamental that Brazil produces an appropriate plan of analysis and spatial allocation of human activities in the marine and coastal environment, i.e., effectively, the Marine Spatial Planning.

Taking into consideration the factors explored throughout this text, it is recommended, therefore, that the State seek to further expand the debate with the Brazilian society, armed with evidence, through updated data and information that point to the economic, social and environmental relevance of the Blue Amazon. Thus, it is important to be clear about the close relationship between the Blue Economy and Sustainable Development and, therefore, take advantage of the international *momentum* favorable to the seas and oceans agenda – as highlighted in the 2030 Agenda and the Decade of Ocean Science. It is also recommended that the debate around the subject not be restricted only to government and academia, but that it involve civil society in a broader and more transversal way.

The statistical techniques and multidisciplinary and multisystemic studies required to obtain an officially recognized and widely debated methodology will be of great use as a subsidy for the development of public policies on the subject – especially considering the perspective of data-driven economics. Thus, it becomes possible to answer the question posed at the beginning of this paper, so as to clearly confirm the hypothesis initially presented – that is, the existence of important social, economic and environmental motivations for the measurement and constant monitoring of the Brazilian Sea GDP.

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