

MARITIME ECONOMY: CHALLENGES AND POSSIBILITIES FOR BRAZIL IN THE BLUE AMAZON

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ABSTRACT

With more than 7,000 kilometers of coastline, Brazil can be considered a maritime country. Given the relevance of the national maritime cluster and the potential contributions of the blue economy to the development of the country, this text aims to analyze the opportunities existing at sea, emphasizing the importance of science, technology and innovation within the scope of the activities undertaken. From an economic and international relations approach, the paper seeks to present the Brazilian maritime space and the resources therein, as well as the main challenges for its sustainable exploitation – especially considering geopolitical and public policy aspects.

Keywords: Maritime Economy. Blue Economy. Science, Technology and Innovation. Blue Amazon. South Atlantic.

ECONOMIA DO MAR: DESAFIOS E POSSIBILIDADES PARA O BRASIL NA AMAZÔNIA AZUL

RESUMO

Possuindo mais de 7 mil quilômetros de litoral, o Brasil pode ser considerado um país eminentemente marítimo. Tendo em vista a relevância do cluster marítimo nacional e as potenciais

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contribuições da economia azul para o desenvolvimento do país, este artigo tem como propósito analisar as oportunidades existentes no mar, enfatizando a importância da ciência, tecnologia e inovação (CT&I) no âmbito das atividades desenvolvidas. A partir de uma abordagem interdisciplinar combinando Economia e Relações Internacionais, busca-se apresentar o espaço marítimo brasileiro e os recursos nele presentes, bem como os principais desafios para a sua exploração sustentável – considerando especialmente aspectos geopolíticos e de políticas públicas.

Palavras-chave: Economia do Mar. Economia Azul. Ciência, Tecnologia e Inovação (CT&I). Amazônia Azul. Atlântico Sul.

ECONOMÍA DEL MAR: DESAFÍOS Y POSIBILIDADES PARA EL BRASIL EN LA AMAZONIA AZUL

RESUMEN

Con más de 7 mil kilómetros de costa, Brasil puede ser considerado un país eminentemente marítimo. Teniendo en cuenta la relevancia del cluster marítimo nacional y las potenciales contribuciones de la economía azul al desarrollo del país, este artículo tiene como objetivo analizar las oportunidades existentes en el mar, destacando la importancia de la ciencia, la tecnología y la innovación (CT&I) en el ámbito de las actividades realizadas. A partir de un enfoque interdisciplinario que combina la Economía y las Relaciones Internacionales, el texto busca presentar el espacio marítimo brasileño y sus recursos, así como los principales desafíos para su explotación sostenible, especialmente considerando los aspectos geopolíticos y de políticas públicas.

Palabras clave: Economía del Mar. Economía Azul. Ciencia, Tecnología e Innovación. Amazonia Azul. Atlántico Sur.

1 INTRODUCTION

After the turn of the century, the sea economy – or blue economy – has been object of growing interest of states and companies with high technological potential (JACQUET; PACHAURI; TUBIANA, 2011; JACQUET; JACKSON, 2018; ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, 2019; RIO, 2019). In fact, there are different definitions corresponding to ocean-related activities around the world: ocean industry, marine industry, marine economy, maritime activities, and so on (PARK; KILDOW, 2014; OECD, 2019, p. 138). This text adopted the definition of ocean economy established by the Organization for Economic Cooperation and Development (OECD) as the sum of economic activities of ocean-based industries, together with assets, goods and services provided by marine ecosystems (ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, 2019, p. 33).

According to the OECD report “*The Ocean Economy in 2030*”, the blue economy has two main cornerstones, one concerning resources and one concerning services

(ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, 2016). Both are interdependent, given that industries depend on marine ecosystems, while the latter suffer the impacts of industrial activity. The economic value associated with each pillar can be distinguished according to whether the goods and services are traded or not. In view of the growing threats to ocean health, combined with the recognition of this interdependence, the ecosystem approach has been acknowledged as the most appropriate strategy for marine management. Some of the instruments currently employed by some countries are Integrated Coastal Zone Management (ICZM), Marine Spatial Planning (MSP) and Marine Protected Areas (MPA).¹

Driven by technological advance, there is currently a sort of “race to the bottom of the sea” by a growing number of states and companies, with the purpose of exploring resources and turning them into economic and scientific assets, a process known as ocean grabbing (FOLEY; MATHER, 2019). This trend also includes Antarctica, since the high seas and the frozen continent are two strategic frontiers (BARROS-PLATIAU; GONÇALVES, 2019).

The perspective of science, technology and innovation (ST&I) for the oceans brings two major paths of reflection for Brazilian development. The first is the possibility of a more sustainable blue economy, contributing to the reconciling of digital, ecological and energy transitions (ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, 2019). The second is that only a small group of countries and companies are able to invest heavily in ST&I (BLASIAK; YAGI, 2016; BLASIAK et al, 2018; ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, 2019).² Thus, there is a strong concentration of resources in the hands of a few states and companies.

In addition to bringing opportunities to the blue economy and to research, ST&I provide ways for inter-institutional collaboration and reinforce the culture of innovation (BRAZIL, 2018a). Some of the potentially benefited initiatives are applied scientific research, access to knowledge, marine startups, new technologies for aquaculture, more sustainable activities, communication with society and intersectoral synergies. In these sectors, different actors, such as public authorities, universities and companies, can build innovation networks. Such networks can contribute to the interaction between numerous actors and society in general, as in the case of the Triple Helix model, adopted, for example, by the Brazilian Navy (BRAZILIAN NAVY, 2017; ANDRADE; FRANCO; HILLEBRAND, 2019).

Developed by Etzkowitz and Leydesdorff (1995; 1998), the Triple Helix model establishes close cooperation between government, academia and industry in the innovation ecosystem, generating direct benefits for the results achieved,

1 *Integrated coastal zone management (ICZM), marine spatial planning (MSP) e marine protected areas (MPA), respectivamente.*

2 The countries most frequently found in the literature of International Relations and areas related to the blue economy, as well as ST&I, are Australia, China, Denmark, France, Germany, India, Japan, New Zealand, Norway, Russia, South Korea, the United Kingdom and the United States.

especially within the context of ST&I and research and development (R&D) (ANDRADE; FRANCO; HILLEBRAND, 2019). The adoption of this model is an important inducer for the development of national industry, bringing contributions to various sectors, in particular by allowing the treatment of innovation in a systematic manner (MAGNANI, 2019). The Brazilian Navy's ST&I Strategy, for example, indicates the need for close cooperation among the Triple Helix members, providing mutual support and ensuring synergistic effects for the effective transformation of projects into operational capabilities (BRAZILIAN NAVY, 2017).

Among the main technological sectors related to the blue economy, we can mention autonomous systems, materials and structures, robotics, monitoring of fishing stocks, biotechnology, and offshore oil and gas, all of them of great relevance to Brazil. In addition, ocean economy innovation networks and marine ecosystem accounting³ can be improved through international cooperation in ST&I (ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, 2019, p. 16 e 113). By applying ST&I-based solutions, different aspects related to the sea economy can directly benefit, including, for example, the survey of geological data from the continental shelf, the mapping of marine resources and the construction of vessels and large scale coastal, port and ocean engineering projects (FERNANDES, 2012).

This article has the objective of analyzing the potential opportunities of the blue economy for Brazilian development, emphasizing the importance of ST&I in the scope of maritime activities. After assessing the national profile, it seeks to understand what are the opportunities and challenges for Brazil in the framework of the ocean economy. To this end, a theoretical-normative approach will be carried out regarding the conceptual definitions of maritime spaces, in order to allow a more in-depth exploration throughout the text. The aim is to contribute to the development of a national maritime mentality and to the awareness about the relevance of the Blue Amazon for the Brazilian development. From this purpose, this paper is divided into four sections, besides this introduction.

The first section seeks to present the vast Brazilian maritime region, the resources present in it and the importance of its surveillance and protection. The second section focuses on the blue economy, starting from a global perspective and going deeper into the national scenario, based on the analysis of maritime activities developed in the country, as well as its marine resources. The third section addresses the challenges related to ST&I for the blue economy, especially regarding public policies. Finally, the last section discusses the main topics addressed throughout the work and the results of the research, presenting recommendations and final considerations on the topic.

3 *Ocean economy innovation networks e marine ecosystem accounting*, respectively, in the OCDE jargon.

2 BLUE AMAZON: RIGHT TO EXPLORE, RESPONSIBILITY TO PROTECT

A country with continental dimensions, Brazil has a land territory of approximately 8.5 million square kilometers, being the fifth largest in the world, and a maritime space greater than 3.5 million square kilometers, an area that constitutes the Brazilian Jurisdictional Waters (Acronyms in Portuguese - AJB). The claim to expand the country's continental shelf (equivalent to more than two million square kilometers) is currently under review by the United Nations Commission on the Limits of the Continental Shelf (CLCS).⁴

In addition to the 200 nautical miles that make up the national maritime space, the country also benefits from its overseas territories (ocean islands of Trindade and Martin Vaz and archipelagos of Fernando de Noronha and São Pedro and São Paulo), which together add up to more than one million square kilometers to the total area available for scientific and commercial exploration by Brazil. As a result, the AJB approaches the Amazonian surface in dimension. The main institution responsible for the protection and conservation of this large maritime space, the Brazilian Navy started to call it Blue Amazon, seeking especially to raise awareness about the importance of national waters (BRAZILIAN NAVY, 2019).

The Brazilian coast is 7,367 km long, reaching more than 8,500 km if we consider coastal cutouts, such as bays and recesses (BRAZIL, [n.d.]). The coastal zone of the country is distributed by seventeen federative units, totaling 280 municipalities facing the sea. From North to South, the Brazilian coastal strip is home to 13 state capitals and more than 30 million inhabitants, including also 25 of the country's 35 main ports (IBGE, 2019; ANTAQ, 2020).⁵ In this context, the relevance of the maritime space for Brazil reflects in expressive numbers regarding the national economy, as well as scientific research, job generation, exploration and exploitation of natural resources (notably oil and natural gas), communication lines and trade routes. Therefore, the great relevance of the blue economy for

4 The Brazilian maritime space could be extended to about 5.7 million square kilometers (more than half of the country's continental mass) if Brazil has its claim accepted. Part of the national request has already been accepted within the organization and other areas claimed are still under evaluation.

5 Besides the ports on the Brazilian coast, there are ports located in the interior of the country, such as in Porto Velho-RO, Manaus-AM and Santarém-PA. Although they are not coastal, these ports can be maritime (capable of receiving ocean navigation lines), fluvial (which communicate with other national ports through inland waters) or lacustrine (which receive vessels inside lakes or restricted reservoirs, with no communication with other basins).

national development in Brazil stands out, while the sustainable use of living and non-living marine resources constitutes a challenge for the country.

1.1 Delimitation of the Brazilian Coastal Zone and Brazilian Jurisdictional Waters

Bordered by the Atlantic Ocean, Brazil's coastline represents an enormous frontier and presents both great challenges and opportunities. The Brazilian Coastal Zone is considered a national heritage by the 1988 Federal Constitution and corresponds to the "geographic space of interaction of air, sea and land, including their renewable or non-renewable resources" (BRAZIL, 2004, Art. 3, translated by the authors). This space includes a maritime strip, "that extends for twelve nautical miles, measured from the baselines,⁶ thus comprising the entire territorial sea", and a terrestrial strip, "comprised of the limits of the municipalities that suffer direct influence from the phenomena occurring in the coastal zone" (BRAZIL, 2004, Art. 3, translated by the authors).

The list of municipalities that make up the national coastal zone had been established in 1997 in the National Coastal Management Plan, but after changes in the defined boundaries, it was updated in December 2018 (BRAZIL, 2018b). This is a preliminary list, setting in motion a comprehensive reformulation process. According to the Ministry of Environment, the list is to be updated and published every year (BRAZIL, 2018c). The Brazilian Institute of Geography and Statistics (IBGE), in turn, made available, in March 2019, the list of Brazilian municipalities facing the sea.⁷

The list of municipalities facing the sea covers 17 federative units in two hemispheres and includes 13 state capitals. From a demographic perspective, the region has over 30 million inhabitants. In addition to the intrinsic relationship of the coastal municipalities economy with maritime activities, the influence of such activities also extends to regions near the coast, but not facing the sea. While the total number of inhabitants in municipalities facing the sea corresponds to approximately 16% of the national population, more than 25% of Brazilians live in regions near the coast⁸ (Brazilian Institute of Geography and Statistics, 2011; BRAZIL, 2004; 2018d).

6 Baselines are adopted as the origin of the territorial sea, the contiguous zone, the exclusive economic zone and, in some cases, the legal continental shelf itself. They are established in accordance with the United Nations Convention on the Law of the Sea (BRAZIL, 2004).

7 The Brazilian Coastal Zone also includes municipalities that do not face the sea, based on different conditions, such as distance from the coast line and proximity to coastal metropolitan regions (BRAZIL, 2004).

8 The assessment includes municipalities i) located in metropolitan regions; ii) contiguous to capital cities and large coastal cities that present conurbance; iii) at a distance of less than 50 km from the coast, that include activities of great environmental impact in the coastal zone or coastal ecosystems; iv) that share all their limits with other municipalities that fit the previous situations.

Figure 1 – Brazilian population density map (2010)



Source: Brazilian Institute of Geography and Statistics, 2011b.

A large part of the population near the coast is directly or indirectly involved in economic activities related to the sea (oil and natural gas production, tourism, fishing, transportation, and so forth). The most recent demographic census of Brazil, illustrated in figure 1, demonstrates the great concentration of the Brazilian population on the coast of the country, as there were established the first and most stable points of settlement in the country (Brazilian Institute of Geography and Statistics, 2013).

After a period in which national efforts of interiorization showed important results, the trends related to the development of the country have advanced again towards the South Atlantic in recent decades, especially since the discovery of the pre-salt layer in the region (CARVALHO, 2018). In this regard, it is essential to understand the characteristics of the Blue Amazon and the strong influence of activities carried out in this area on the Brazilian economy. Therefore, it is first necessary to know the different zones that make up the Brazilian Jurisdictional Waters and their delimitation.

The United Nations Convention on the Law of the Sea (UNCLOS), signed in 1982,⁹ “constitutes the main framework for regulating the use of the oceans”, standardizing aspects such as “delimitation of borders, environmental regulations, scientific research, trade and resolution of international conflicts involving marine issues” (LIMA, 2014, p. 6, translated by the authors). The UNCLOS established different concepts to delimit maritime spaces, namely: i) the territorial sea; ii) the contiguous zone; iii) the Exclusive Economic Zone; and iv) the continental shelf (UNITED NATIONS, 1982).

The territorial sea of a coastal state consists of an area of sea adjacent to its territory, limited to 12 nautical miles¹⁰ measured from the baselines, in which the state has the right to exercise its sovereignty. It also extends to the overlying airspace and the bed and subsoil of that sea (UNITED NATIONS, 1982, p. 27). The contiguous zone to the territorial sea extends for another 12 nautical miles, reaching therefore 24 nautical miles from the baselines. In this contiguous zone, “the coastal State may exercise the control” necessary to prevent and repress “infringement of its customs, fiscal, immigration or sanitary laws and regulations within its territory or territorial sea” (UNITED NATIONS, 1982, p. 35, our translation).¹¹

The Exclusive Economic Zone (EEZ) is located beyond the territorial sea and is adjacent to it, extending up to 200 nautical miles from the baselines. Considering the rights and freedoms of other States established by the document, the UNCLOS determines that the coastal State has over the EEZ¹² “sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living”¹³ and jurisdiction [...] in relation to the establishment and use of artificial island, installations and structures, the carrying out of marine scientific research and the protection and preservation of the marine environment” (Organização das Nações Unidas, 1982, p. 43-44, our translation).¹⁴

Finally, the convention determines that the continental shelf of a coastal state “comprises the seabed and subsoil of the submarine areas that

9 This convention entered into force only in the following decade, on November 16, 1994.

10 One nautical mile is equivalent to 1.85 km.

11 *In a zone contiguous to its territorial sea, described as the contiguous zone, the coastal State may exercise the control necessary to: (a) prevent [and b) punish] infringement of its customs, fiscal, immigration or sanitary laws and regulations within its territory or territorial sea”.*

12 Including the waters over the seabed, the seabed itself and its subsoil (UN, 1982, p. 43).

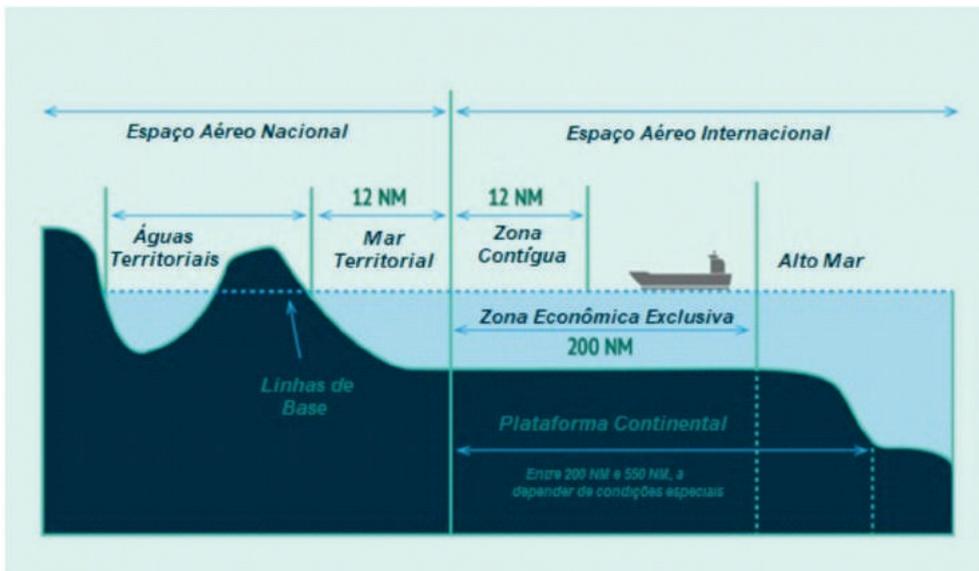
13 *“Sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living”.*

14 *“Jurisdiction [...] with regard to (i) the establishment and use of artificial islands, installations and structures; (ii) marine scientific research; (iii) the protection and preservation of the marine environment”.*

extend beyond its territorial sea throughout the natural prolongation of its land territory to the outer edge of the continental margin”¹⁵ This extension goes at least up “to a distance of 200 nautical miles from the baselines from which the breadth of the territorial sea is measured”, if “the outer edge of the continental margin does not extend up to that distance”¹⁶ (UNITED NATIONS, 1982, p. 53).¹⁷

Beyond the limits of the continental shelf, there is the high seas, an area beyond national jurisdictions (ABNJ), open to all states for peaceful use, such as navigation, overflight, laying of cables and underwater pipelines, fishing, scientific research and the establishment of artificial islands and other facilities permitted by international law (UNITED NATIONS, 1982, p. 57). Figure 2 shows the maritime zones defined by UNCLOS and the respective established limits.

Figure 2 – Delimitation of maritime zones established by United Nations Convention on the Law of the Sea



Source: BATONGBACAL; BAVIERA, 2013 (adapted).

15 “It comprises the seabed and the subsoil of submarine areas that extend beyond its territorial sea along the natural extension of its terrestrial territory to the outer edge of the continental margin”.

16 “To a distance of 200 nautical miles from the baselines from which the breadth of the territorial sea is measured where the outer edge of the continental margin does not extend up to that distance”.

17 When the outer edge of the continental margin of a coastal state exceeds 200 nautical miles from the baselines, the limits of the continental shelf on the seabed shall not exceed 350 nautical miles, being therefore its maximum width (UN, 1982).

Signatory of UNCLOS since 1982, Brazil manages its maritime spaces in strict compliance with the standards of the convention. The Blue Amazon presents great natural assets, many of them not yet measured, but its expansion, requested by Brazil as mentioned, may represent a significant increase in the resources available to the country. In particular, it should be noted that part of the claimed area includes the pre-salt layer, with possible deposits of oil and natural gas. In this regard, the next section intends to explore the diversity of natural resources existing in Brazilian waters.

3 THE BLUE AMAZON'S RESOURCES AND ITS OPPORTUNITIES

The Blue Amazon constitutes a considerable part of the South Atlantic, also having a biological and strategic association with the high seas and Antarctica.¹⁸ Thus, there are several opportunities for the sustainable use of biological and mineral marine resources, as well as their adequate conservation. Throughout its extension and in its soil and subsoil, the AJB presents enormous natural assets. There are countless possibilities for investment and job creation, connecting local communities with the global economy, scientific research and technological innovations. In this context, the oil mineral resources located in the national maritime area stand out. Particularly important in this context are the oil mineral resources located in the national maritime area.

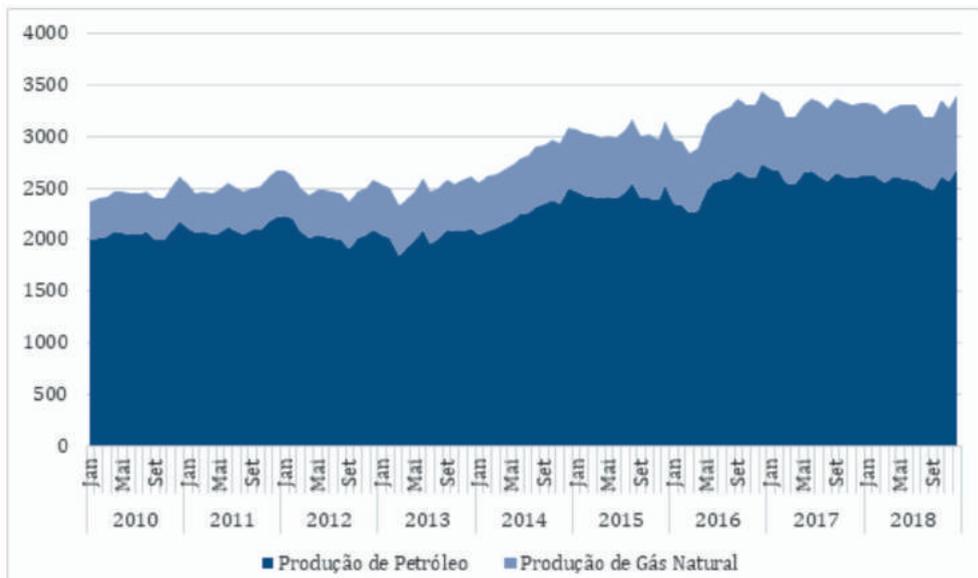
The analysis of the data published by the National Agency of Petroleum, Natural Gas and Biofuels (National Agency of Petroleum, Natural Gas and Biofuels) in the last 10 years, through its monthly bulletin,¹⁹ allows verifying the relevance of AJB for the sector. Although they comprise about 10% of all the national oil and natural gas wells, maritime fields represent more than 90% of Brazil's oil production and around 80% of national natural gas production. In December 2018, these figures reached 96% and 83.7%, respectively, compared to 91.4% and 75.7% in December 2010 (ANP, 2011; 2019). The growth directly relates to the discovery of oil and natural gas in the Brazilian pre-salt layer, in 2007, as will be further discussed.²⁰ Graph 1 shows the evolution of oil and natural gas production in Brazil in recent years.

18 The recognition of Antarctica as a strategic region for Brazil was especially reinforced through its inclusion by the National Defense Strategy (END) as part of the national strategic environment (BRAZIL, 2012a).

19 "*Boletim Mensal da Produção de Petróleo e Gás Natural*" (Monthly Bulletin of Oil and Natural Gas Production). Editions available at: <http://www.anp.gov.br/publicacoes/boletins-anp/2395-boletim-mensal-da-producao-de-petroleo-e-gas-natural>.

20 Refers to the production of hydrocarbons carried out in the geological horizon called "pre-salt layer", in fields located in the area defined in Law No. 12,351 of 2010 (National Agency of Petroleum, Natural Gas and Biofuels, 2019, p. 3).

Graph 1 – Total oil and natural gas production in Brazil (2010-2018)
In Barrels of Oil Equivalent per Day



Source: Monthly Bulletins of the National Agency of Petroleum, Natural Gas and Biofuels (ANP). Elaborated by the authors.

As shown in graph 1, the total volume of oil and natural gas produced in Brazil has been increasing. At the beginning of the period under review (January 2010), oil production reached an average of 1.997 million barrels per day (MMBbl/d), while natural gas production reached around 368 thousand barrels of oil equivalent per day ((Mboe/d). At the end of the period (December 2018), the national production of oil totaled 2.691 MMBbl/d and that of natural gas almost doubled, reaching 715 Mboe/d. As previously mentioned, most of these resources come from maritime fields, whose relevance has risen significantly since the discovery of oil and gas in the pre-salt layer, which, added to the expansion of investments in production fields and technological improvement, explains the growth observed in total production volume.

The resources contained in the so-called pre-salt layer consist of large deposits located under more than three kilometers below the seabed, extending from the coast of Espírito Santo to the coast of Santa Catarina, reaching approximately 150 thousand square kilometers of area. According to specialists, this is the world's largest discovery of the oil and natural gas industry in the last fifty years, due to the great potential of exploration of the reserves (BRAZIL, 2020; PINTO, 2017).

Since 2010, when the production of oil and natural gas in the pre-salt layer began, the volume produced also showed consistent growth. In September 2010, production in the pre-salt was 50.78 thousand barrels of oil per day (Mbbbl/d) and approximately 11.9 thousand barrels of oil equivalent per day (Mboe/d) of natural gas. These figures jumped to around 1.5 million barrels of oil per day and 387.4 thousand barrels of natural gas in December 2018. In the same period, the number of production wells in the pre-salt layer rose from 4 to 85. Also in December 2018, the national production of oil and natural gas in the pre-salt reached over 55% of the total produced in the country, reinforcing its great relevance to the sector (National Agency of Petroleum, Natural Gas and Biofuels, 2011; 2019).

In addition to the importance of oil resources for Brazil, other considerable natural assets in the Blue Amazon should be highlighted. Besides oil and natural gas, there are several other exploitable minerals in national waters. The intensified use of technologies has increasingly led to mineral exploration in deep waters, for example. Among the resources with the greatest economic value on the Brazilian continental shelf are aggregate mineral goods (sand and gravel), limestone, heavy mineral deposits (gold, diamond, zircon, magnetite, among others), phosphate rocks, coal, gas hydrates, polymetallic sulfides, sulfur and potassium (SOUZA et al., 2009; BRAZILIAN NAVY, 2019).

It is also worth pointing out the existence of resources with great political and strategic value for Brazil in international waters close to its continental shelf, like the cobalt crusts in the area known as the Rio Grande Rise (or Rio Grande Elevation). Contiguous to AJB and about 1.5 thousand kilometers away from the Brazilian coast, the region has great potential for exploitable mineral resources, which has stimulated joint efforts of research and mapping by the Geological Survey of Brazil (CPRM) and the Brazilian Navy since 2009. After sending several expeditions and collecting rock samples from the region, Brazil requested the right to explore the area to the International Seabed Authority (ISA), the agency responsible for regulating such activities (BAIMA, 2018)²¹.

Recognized for the strong integration between geological activities and environmental preservation, the Brazilian proposal was approved in 2014, making the country the first in the southern hemisphere to establish a contract with ISA. Since then, Brazil has been alongside nations such as Russia, China, Norway, France, Germany, Japan and South Korea with regard to advanced mineral research in the oceans. In addition to cobalt, it is expected to find in the region minerals of strategic importance

21 Desdobramentos mais recentes são Resoluções 17 e 18 de 2020 da Secretaria da Comissão Interministerial para os Recursos do Mar (SECIRM). Disponível em: <https://www.in.gov.br/en/web/dou/-/resolucao-n-17-de-15-de-setembro-de-2020-281063756> e <https://www.in.gov.br/en/web/dou/-/resolucao-n-18-de-15-de-setembro-de-2020-281063723>. Acesso em 12 out. 2020.

to the country, such as nickel, platinum, manganese, thallium and tellurium (COMPANHIA DE PESQUISA DE RECURSOS MINERAIS, 2017; 2019; Fundação de Amparo à Pesquisa da Cidade de São Paulo, 2018).

In December 2018, Brazil submitted to CLCS another proposal to extend its continental shelf, this time on its eastern margin, which would include, if approved, the Rio Grande Rise in the AJB. Following the procedures related to claims of this order, the analysis of this Brazilian submission within the commission should occur from 2023 onwards. Figure 3 illustrates the main mineral resources in the Blue Amazon, also highlighting those existing in the Rio Grande Rise.

Figure 3 – Main mineral resources found in the Blue Amazon and Rio Grande Rise



Source: Universidade Estadual Paulista CIÊNCIA, 2010; SOUZA; KARG, 2016 (adapted).

Apart from the mineral resources existing in the AJB, it is also worth emphasizing the enormous biodiversity found in the Blue Amazon. Besides the unquestionable environmental importance, the great variety of marine organisms found in national waters contributes especially in the development and application of biotechnology, as they have properties with wide applicability in relevant areas for society - such as drugs, cosmetics and food (BRAZILIAN NAVY, 2019).

Several other activities constitute the national maritime cluster.²² Port operations, for example, are responsible for the transportation of about 80% of Brazil's foreign trade, considering the value of goods. On a daily basis, a significant volume of products such as sugar, agricultural grains, minerals, fertilizers and refrigerated or frozen food, among others, pass through Brazilian ports (both by ocean transportation and by cabotage shipping). As well as being essential for the country's logistics, the maritime ports originate thousands of jobs and contribute directly to the national economy (BEIRÃO; MARQUES; RUSCHEL, 2018).

Among other relevant activities for the national economy performed in maritime territory, fishing and aquaculture also stand out. The sea is also fundamental in food security efforts. Inland fishing is an activity of great significance to the economy, especially at the regional level (Food and Agriculture Organization of the United Nations, 2020). However, some challenges arise in the management of the fishing sector, such as illegal, unreported and unregulated fishing, which causes serious impacts on marine biodiversity and may even compromise the fishing activity itself (BEIRÃO; MARQUES; RUSCHEL, 2018; Food and Agriculture Organization of the United Nations, 2020).²³

22 The maritime cluster can be conceptually defined as i) an industrial complex; ii) an agglomeration of interconnected industries; or iii) a community-based network (DOLOREUX, 2017). Hence, among the most relevant factors for the consolidation of a maritime cluster are innovation, competitiveness, strategy and policy formulation (KOLIOUSIS, 2019). In this sense, it is relevant to mention the discussions about the existence of a consolidated maritime cluster in Brazil, considering that its formation derives from a set of necessary actions and the establishment of well-defined strategic objectives (MATIAS, 2009; PINTO, 2016). Given the scope of this article, we have chosen to consider a maritime cluster as the combination of industries and sectors related to the maritime economy, despite its current level of integration.

23 Since 2015, the Food and Agriculture Organization of the United Nations (FAO), in partnership with the Global Environment Facility (GEF), has been developing a project called REBYC-II LAC, which aims to reduce by-catches in trawl fisheries in Latin America and the Caribbean. Brazil, Colombia, Costa Rica, Mexico, Suriname and Trinidad and Tobago are participating in the initiative, designed to adapt, support and disseminate socio-economic policies, technologies and good practices related to the sustainable management of trawl fishing (Food and Agriculture Organization of the United Nations, 2015). Preliminary results of the project were indicated in the report "The State of World Fisheries and Aquaculture 2020" (Food and Agriculture Organization of the United Nations, 2020).

Considering the relevance of the activities related to the blue economy and the extent of the natural resources existing in the Blue Amazon, it is fundamental for Brazil the development of in-depth multi-sectoral studies in order to quantify the value generated within the maritime activities, thus estimating the so-called “GDP of the Sea” (*PIB do Mar*). It is also important to emphasize that coordinated measurement efforts should involve the participation of different government bodies, as well as academia, industry and the sectors that make up the national maritime cluster. In this regard, researchers have been conducting investigations on this issue (CARVALHO, 2018; SANTOS, 2019), seeking to develop methodologies that allow the calculation not only of the values currently generated, but also of those that can be achieved by further exploring the country’s maritime territory.

It is also important to mention the great impact that accidents, crimes and environmental disasters can have on the ocean economy. At the end of August 2019, for example, oil stains were spotted on the northeast coast of Brazil, being the source still unknown. By November 2019, according to Brazilian Institute of the Environment and Renewable Natural Resources, eleven states had been affected, totaling 817 locations in 126 municipalities, from the northeast to the southeast of the country (Brazilian Institute of the Environment and Renewable Natural Resources, 2019).²⁴ Criminal action is suspected and investigations to determine the origin, extent and motives continue.

This is not only a disaster with serious environmental consequences, but also social and economic repercussions, affecting the exploitation of living resources in several states and harming the economy of families and companies from various sectors, such as fishing and tourism. The monitoring of Brazilian waters is therefore essential to ensure that the country’s economy is not impaired by episodes like this, deliberate or not. As part of the efforts to investigate the appearance of the oil stains, as well as to monitor, contain and clean up the affected beaches, the operation “Blue Amazon – Clean is established under the coordination of Monitoring and Evaluation Group (GAA), composed of the Brazilian Navy, IBAMA and ANP, (BRASIL, 2019)”. At the end of November 2019, there were approximately ten thousand military personnel from the three Forces involved in many operations, in addition to approximately five thousand employees from IBAMA, ICMBIO, Civil Defense and Petrobras (BRAZILIAN NAVY, 2019b).

4 CHALLENGES FOR BRAZIL AND THE WORLD

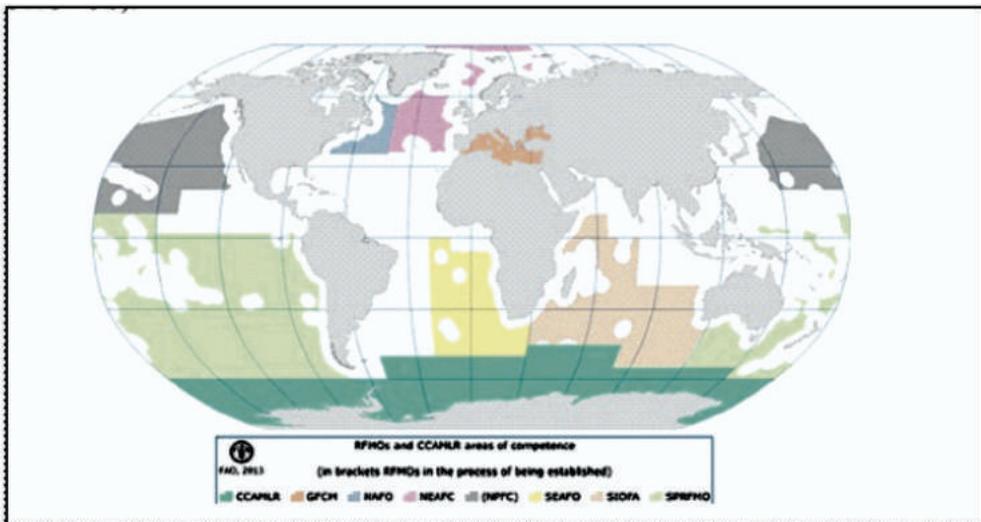
Besides the economic issues related to the Blue Amazon, the geopolitical dimension of this space also deserves special attention. In a global context, challenges related

24 According to IBAMA’s report, the concept of location used in the survey is restricted to an area of 1 km along the coast. A beach with a 10 km strip would therefore have 10 locations (IBAMA, 2019).

to the oceans follow the general trends of greater complexity of threats (KHANNA, 2008; KNOTT; NEIS, 2017) and of interconnectivity between civil and military actors (KHANNA, 2008, 2016).²⁵ The existence of abundant natural resources consists of a potential greed factor in relation to the Brazilian maritime territory. In addition, the Blue Amazon corresponds to a large portion of the South Atlantic, a region that is home to telecommunications lines, an intense flow of commercial vessels and not rarely military exercises from different countries.

The South Atlantic is also one of the most important “institutional voids” on the planet, while the North Atlantic, by contrast, has consolidated and effective institutions (TOMÉ SILVA, 2020). Notable examples are the regional fisheries management organizations (RFMOs), which may have mandates covering both inland waters and beyond national jurisdictions (FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, 2020). Worldwide, there are eight major RFMOs (ÁSMUNDSSON, 2016) and fifty-three regional fishery bodies,²⁶ as illustrated in figure 4.

Figure 4 – Regional fisheries management organizations (RFMOs) areas of competence



Source: FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, 2016.

25 In 2010, the North Atlantic Treaty Organization (NATO) report “NATO 2020: assured security; dynamic engagement”, for example, stressed the need to be ready to deal with volatile and unpredictable threats such as terrorism, cyber attacks, sabotage of critical infrastructure and disruption of maritime supply routes (NATO, 2010).

26 *Regional Fishery Bodies*, de acordo com a FAO. Ver mais em: <http://www.fao.org/figis/geoserver/factsheets/rfbs.html>.

Although not geographically linked to AJB, the Antarctic continent has a strong influence on the Brazilian climate and the living resources found in the Blue Amazon (MATTOS, 2014; BRAZIL, 2012b), being a relevant component for a comprehensive understanding of the national blue economy.²⁷ In this perspective, Antarctica should be considered with particular interest in the geopolitical and strategic spheres. It cannot be ignored that in this continent there are large reserves of natural resources, although Antarctica is totally destined for scientific activity by virtue of the Antarctic Treaty, which came into force in 1961 (ANDRADE et al., 2018). Different mappings in the region have already verified the existence of resources such as mineral coal, mica, beryl, iron, graphite, molybdenum, gold, silver, manganese, among others. In addition, it is estimated that Antarctica contains about 70% of all potable water on the planet, considering the glaciers present on the continent (HERZFELD, 2004; SIMÕES, 2011).

Throughout the 1970s, there were intense discussions about the economic exploitation of Antarctic mineral resources. In this context, in 1988, the Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA) was elaborated. The convention, however, never entered into force, in special due to the difficulty of exploitation of such resources, given the extreme climate and geographical conditions of the Antarctic continent. The advance of exploration technologies and the increase in the price of minerals, though, may eventually make this exploration viable. It is also worth mentioning that in 2048 the end of the moratorium on such exploitation is expected under the Antarctic Treaty (ANDRADE et al., 2018).

The existence of this extensive mineral reserve in Brazil's strategic environment must be considered in the formulation of public policies and in the scope of national strategic interests. Countries like Australia and Argentina, for example, have already submitted to the UN the request to extend their continental platforms from territories claimed in Antarctica, while China has already shown interest in starting mineral exploration in that continent, even before 2048. In addition, the region has enormous potential for fishing (not hindered by the treaty) and tourism, and is essential for the study and understanding of climate change.

As observed, the oceans are currently intensely permeated by economic, scientific, military and industrial activities. Therefore, the reelection of Brazil to the Council of the International Maritime Organization (IMO) in November 2019 is a very relevant fact. Within the framework of the blue economy, the debate over access to marine resources outweighs efforts to preserve and conserve them, encompassing above all "the appropriation [of these] resources by technological powers over others" (BARROS-PLATIAU; BARROS, 2017, p. 453-454, translated by the authors).

27 In addition, the main route to Antarctica is in the South Atlantic, where Brazilian commercial, tourist and communication lines are located (ANDRADE et al., 2018; SILVEIRA, 2012).

States and companies have been mapping the high seas and seabed in search of mineral and biological resources that may be of commercial interest. In the case of mining in areas beyond national jurisdiction, there is only the prospect of exploration contracts. Although there is no ongoing exploration activity, it is estimated that it will be regulated by means of a mandatory instrument currently under negotiation and expected for 2020, the Mining Code. In the case of living resources, there are regimes for fishing and management/protection of species such as whales and sharks, but there is no international regime for the protection of biodiversity itself, nor for the control of bioprospecting activities in the high seas. In this regard, the negotiations for a future mandatory agreement under the aegis of the UN should lead to a final text in 2021, instituting a regime for the so-called BBNJ (Biodiversity Beyond National Jurisdiction). Unquestionably, this is one of the great challenges for Brazil today when it comes to regulating the exploitation of resources.

In addition, an increase in the number of private actors in the discussions and decision making processes on the subject, especially regarding companies, is also observed (BLASIAK; YAGI, 2016). The protection and management of the oceans thus should ideally occur jointly by a diversity of actors and particularly orchestrated by the States, resulting in greater relevance of the global governance of the oceans and in the development of the blue economy concept (BARROS-PLATIAU; BARROS, 2017).

The development of public policies directed to activities and sectors related to the sea (that is, to the maritime cluster) in Brazil should consider, above all, the sustainable exploitation of the Blue Amazon and its potentialities. Within the context of federal administration, the theme is addressed especially by the Oceans, Coastal Zone and Antarctica program, whose main objective is “to promote scientific and technological knowledge, biodiversity conservation, sustainable use of natural resources, effective management of coastal and marine spaces and the interests of the country in the oceans and Antarctica” (ENAP, 2019, translated by the authors).²⁸

Among the main challenges for Brazil to overcome in order to make effective use of the socio-economic, environmental and scientific potential of the sea, are an inefficient governance structure, poor integration of programs and projects, and insufficient national policies for the oceans. There is also a low priority given to policies directed at the sea,

28 With the purpose of identifying the main challenges to be addressed by public policies in Brazil, the National School of Public Administration (ENAP), together with different federal government agencies, promoted planning workshops throughout 2019 for the Multiyear Plan (PPA) that would be in force between 2020 and 2023. In May 2019, the workshop on the Oceans, Coastal Zone and Antarctica program was held to define the results to be achieved and the priority actions of the program for the period.

caused particularly by the absence of a national maritime mentality.²⁹ Greater integration among the actors involved in the elaboration and implementation of such public policies is therefore expected to ensure Brazil's interests in the oceans, coastal zone and Antarctica (NATIONAL SCHOOL OF PUBLIC ADMINISTRATION, 2019).

5 FINAL REMARKS

Brazil has mineral and biological marine resources that make the region called Blue Amazon a necessary priority for Brazilian public policies. Around 3.5 million square kilometers, with the possibility of adding more than two million square kilometers through the expansion of the country's continental shelf, make up the Brazilian Jurisdictional Waters. Distributed by seventeen federative units, the broad Coastal Zone of the country reinforces the relevance of the national maritime space and the blue economy for Brazil.

The existence of abundant living and non-living marine natural resources in Brazilian maritime territory raises special attention in terms of surveillance and protection of this vast area. Mineral reserves, especially oil and natural gas, add to biodiversity and ecosystem services, while also illustrating the potential for exploitation and the need to preserve these assets. Considering the dimension of these existing resources, as well as the diversity of activities that constitute the national blue economy, it is essential to conduct in-depth studies to measure the value generated for the country through the sea, estimating therefore a "GDP of the Sea" ("*PIB do Mar*"). Therefore, research efforts must be multi-sectoral in nature and include the participation of different relevant actors, such as government, academia, industry and representatives of economic sectors.

The national capability of monitoring AJB and the presence of the Brazilian State in these waters are essential. The challenges and threats existing in the maritime region (such as smuggling, illegal fishing, piracy, environmental crimes,

29 By maritime mentality, one can understand "the conviction or belief, individual or collective, of the importance of the sea and the development of habits, attitudes, behaviors or willingness to act, in order to use, in a sustainable way, the potentialities of the sea" (BRAZIL, 2016, p. 26, translated by the authors). In this direction, the government has sought to undertake actions to stimulate and raise awareness on the subject. In the scope of CIRM, for example, the program "Promotion of Maritime Mentality (PROMAR)" aims to promote awareness through projects that address the preservation and sustainable use of the resources found in AJB. In addition, specific initiatives are carried out with local communities, such as in Itaguaí, where the Brazilian Navy has a naval complex and promotes socio-educational, professional and environmental awareness actions (BRAZILIAN NAVY, [s.d.]).

among others) present great complexity and demand an institutional and coordinated response. Responsible for protecting national territorial waters, the Brazilian Navy has undertaken efforts to better protect and preserve this area, especially through its strategic programs, with focus on ST&I and based on the Triple Helix model, as discussed. In this regard, it is recommended to stimulate and improve the interoperability between the agencies that operate in the AJB, as well as the creation of specific strategies for actions concerning the defense and preservation of the Blue Amazon, as in the case of GAA in 2019.

With respect to living resources, the exploitation of marine biotechnology is far from exhausting its enormous potential in areas such as medicine, pharmacology, food and cosmetics. Under the perspective of ST&I, the opportunities of the blue economy in Brazil are diverse, but the initiatives in this field are still incipient, so it is necessary to make continuous investments in the area. In particular, it is essential to prevent the environmental deterioration of the Blue Amazon, optimizing the sustainable use of its resources and avoiding the risk of losses to national economy.

Besides the Blue Amazon, there are also international maritime spaces of great importance for Brazil. As mentioned, the Rio Grande Rise consists of a strategic region for the country, being rich in mineral resources. Having received authorization to explore the area, Brazil has achieved greater prominence in terms of international water exploration and advanced mineral research in the ocean.

Another region of relevance to national interests, Antarctica is an important part of the Brazilian strategic environment. In this sense, Brazilian participation in the Antarctic Treaty System is an asset and needs to be analyzed with priority by the federal government. In addition to influencing climatic conditions and the country's living and mineral resources, the Antarctic continent also has important natural resources and their exploitation, although currently prohibited, may be on the agenda in future discussions in the context of collective management in force.

The success in protecting and preserving the Blue Amazon permeates different paths. It is particularly important to highlight the importance of local and global governance aspects in relation to the oceans, as well as in the future creation of innovation networks. The increase in the number of actors participating in the decision-making processes on the subject represents a challenge for Brazil in terms of the development of public policies. Thus, it becomes necessary to acknowledge the interdependence of such actors, which include not only the government, but also industry and market, academia, non-governmental organizations and representatives of local communities, including small producers and fishermen.

Finally, the development of a maritime mentality by the Brazilian society is fundamental for the preservation, protection and sustainable exploitation

of the Blue Amazon. In this regard, it is recommended the deepening of public policies and initiatives aimed at raising consciousness about the importance of Brazilian maritime territory for national development. This awareness process is also related to the development of scientific research and, in particular, greater communication efforts with society.

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