

Bioceanic Routes in South America and possible impacts on Brazilian Maritime Security and Defense

Rotas Bioceânicas na América do Sul e possíveis impactos na Segurança e Defesa Marítima do Brasil

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ABSTRACT: This article analyzes possible impacts and opportunities with the construction of bioceanic routes or corridors in South America, i.e. logistical infrastructure projects that aim to connect the coasts of the Atlantic Ocean and the Pacific Ocean, making it possible to transport cargo port-to-port by land. This shows how Brazil could overcome its relatively unfavorable logistical position in the South Atlantic in the current scenario of trade flows increasingly focused on the Asia/Pacific axis. An analysis is made of the main export and import logistics flows and maritime routes in the central region of South America and, in addition, the study considers whether Brazilian ports would lose out in terms of cargo volume if there were the possibility of using railroads, highways and waterways linked to Pacific ports in other countries. Finally, the article discusses how the bioceanic routes could contribute to the processes of regional integration and deepening, economic development and the formation of a South American "common market".

Keywords: bioceanic routes; maritime and port logistics; transportation infrastructure.

RESUMO: Este artigo analisa possíveis impactos e oportunidades com a construção de rotas ou corredores bioceânicos na América do Sul, ou seja, projetos de infraestrutura logística que visam conectar as costas do Oceano Atlântico e do Oceano Pacífico, possibilitando o transporte de cargas porto a porto por via terrestre. Isso demonstra como o Brasil poderia superar sua posição logística relativamente desfavorável no Atlântico Sul no atual cenário de fluxos comerciais cada vez mais focados no eixo Ásia/Pacífico. São analisados os principais fluxos logísticos de exportação e importação e as rotas marítimas na região central da América do Sul e, adicionalmente, o estudo considera se os portos brasileiros perderiam em termos de volume de carga caso houvesse a possibilidade de utilizar ferrovias, rodovias e hidrovias interligadas a portos do Pacífico em outros países. Por fim, o artigo discute como as rotas bioceânicas poderiam contribuir para os processos de integração e aprofundamento regional, desenvolvimento econômico e formação de um "mercado comum" sul-americano.

Palavras-chave: rotas bioceânicas; logística marítima e portuária; infraestrutura de transportes.

1. INTRODUCTION

Access to the sea is an object of desire intrinsic to the expansive nature of the nation state. The existence of a seacoast is a possibility of territorial relief for states that are sometimes surrounded by land borders with other states. Having access

to the sea and the possibility of using military or civil navigation expands the possibilities for a state's political relations and economic exchanges. However, in many situations, it is not enough just to have a seacoast, but it is also necessary for a state to have a good seacoast so that there are no threats to its freedom of navigation, in the sense that it is important that there are no closed seas that freeze, limited passages, straits and channels that restrict its access to the oceans.

Thus, from this perspective, it can be concluded that states that have a coastline have an advantage over those that don't, and states that control maritime access passages have an advantage over those that rely exclusively on using these accesses to reach the sea. As a logical consequence, island states have a strategic advantage, both because of their geographical isolation, which facilitates defense, and because of their free maritime access, which prevents navigation. And states with coastlines on more than one ocean also enjoy better navigational possibilities, having a choice of oceanic routes to choose from, and the ability to transpose their territory via land-based means that make it possible to interconnect different oceans, moving goods and people from one side to the other.

Admiral Ilques Barbosa Júnior, speaking specifically of Brazil's ocean political space, says that it represents "Survival" and "Prosperity"

Survival" because through the sea we receive the products and services that are vital for strengthening national power and, consequently, for neutralizing the strategic vulnerabilities that have the greatest impact on national security and defense, and "Prosperity" because it is from the sea that we send the products needed to obtain the financial resources that are fundamental for national development. (BARBOSA JUNIOR, 2012, p. 223)

Looking back in an anachronistic way, some historical examples can indicate how the conditions of access to the sea have contributed to shaping the position of power and the projection of each nation state. In the case of Russia (imperial, Soviet and federative), maritime access has always been difficult: via the Baltic Sea, it can be blocked by a dozen potentially hostile states before it reaches the open ocean, likewise via the Black Sea, the Aegean, the Mediterranean, the Strait of Gibraltar or the Suez Canal, The Arctic Ocean is blocked by constant freezing, the Bering Strait could potentially be blocked by the United States, and its far eastern coastline in the Sea of Japan could be blocked by the state that names it. This is a limiting factor in Russia's grand strategy, which has favored its enemies, especially those that cannot be reached by land, such as the United Kingdom and the United States.

On the other hand, the United States, the largest military and economic power in the international system, has a vast land territory with two long coastlines that are unobstructed and free of potential threats to the two most strategic oceans on the globe. Its process of development and formation as a power is associated with the creation of its own merchant navy, which is active on its coast, and above all with territorial expansion to the West, expanding a dense network of rail, waterway and road infrastructure. It should be noted that only the Gulf of Mexico is a possible blockade point for the United States, as access to its interior is limited by the Florida and Yucatan peninsulas, with the island of Cuba and the Bahamas at its entrance, geographical positions that were successfully used by the Union against the Confederates during the naval blockade of the American Civil War. Spain and Mexico, both states defeated in wars by the United States, had difficulties in maritime transit in the Gulf, as their enemy in those circumstances had a better ability to control the waters at the entrance of the Gulf and the Caribbean, breaking their lines of communication.

England, and later the United Kingdom, managed to beat the Netherlands in naval wars and in the competition for sea freight in European trade, mainly because of the unfavorable geographical position of the Netherlands, which was blocked by its adversary in the English Channel and the North Sea, while the British were able to maintain operations from their eastern ports with greater tranquility, even in times of war and privateering. Also in constant disputes with the British, France fared better than the Dutch, managing to establish itself as a naval and colonial potential for longer, having - in addition to a much larger territory and population - the favorable characteristic of its "bioceanic" coastline with access to both the Atlantic and the Mediterranean. However, it faced the same obstacle of the blockade of the English Channel, but also British control of the Strait of Gibraltar, which was strategic for limiting access to the Atlantic by European Mediterranean fleets. Spain has coastal characteristics and has faced strategic constraints similar to those of France.

China, on the other hand, has characteristics that are to some extent like Russia's, because - despite having an extensive coastline with good bays and port areas - it encounters several points of naval military blockade by potentially hostile states in its maritime surroundings, making its identification and ability to respond to external threats by sea top of its grand strategy. More so given the historical background of the "century of humiliation", which was consolidated by the occupation of European colonizers who managed to conquer Chinese coastal territories using mainly maritime means and naval superiority.

On the South American continent, it can be seen that no national state has large territorial portions with bioceanic coastlines, with the exception of Colombia, which has a strategic maritime geography. Not surprisingly, it has historically been

the state most influenced by the United States in South America, and the latter even acted to secure Panama's independence and its dismemberment from Colombia, thus facilitating control of the isthmus and canal that enable the bioceanic maritime passage and the movement of military and merchant fleets from East to West, and vice versa. Chile also has bioceanic access in the extreme south of its territory through the Strait of Magellan, but in an inhospitable region, sparsely populated and far from population and economic centers, characterizing it more as a passageway than a maritime hub like the Panama Canal.

Brazil is a state that has accumulated a rare and advantageous maritime conditioning, since it has a land territory of continental proportions and a long seacoast free of geographical formations that would make it possible to block it, and without other states in its immediate maritime surroundings that could represent potential direct threats or competition. Its territory is shaped like a triangle, one of whose points (the Northeastern Salient) juts out into the sea, characteristics that can only be compared to India and South Africa. Its main disadvantage is that, despite having 47.7% of the area of South America, its maritime coastline does not access the largest and most economically important ocean on the globe, the Pacific.

2. THE WORLD ECONOMY MOVING TOWARDS THE ASIA-PACIFIC AXIS AND BRAZIL'S MARITIME DILEMMA

The political and economic importance of the seas and oceans changes and the main flows and gravitational centers have a dynamic that is reconfigured throughout history. The Mediterranean Sea was at the center of the world economy described by Fernand Braudel, whose various civilizations and empires of antiquity established different maritime routes and strategies, making it the "center of the world" for several centuries. In the period of discovery and colonization, technological innovations in maritime navigation and shipbuilding enabled European states to dominate the Atlantic Ocean and overseas territories, establishing intense triangular trade routes in a myriad of interconnected ports in America, Africa and the European metropolises. European maritime expeditions towards Asia initially took the Indian Ocean as their route, and the Pacific gradually became established as a viable route after the colonization of the west coast of Spanish America.

The North Atlantic was at its height of importance in the post-Industrial Revolution, associating the rise of the United States as an emerging economic power with trade with Europe, but with the conquest of California, the construction of the Panama Canal, Asian decolonization and the end of the Second World War, the centrality of maritime logistics began to migrate more intensely to the Pacific, and although it is still one of the most intense and important maritime routes, the North Atlantic has lost relative importance compared to the Pacific route.

The consolidation of Japan among the largest economies in the second half of the 20th century and the strengthening of trade relations between Asian countries (mainly China, South Korea and Taiwan, in addition to Japan) put North Atlantic maritime flows on the back burner and established the North America-Pacific-Asia route as the major maritime route for foreign trade logistics in the 21st century. China's rapid rise to become the world's largest economy enshrines this reorientation of maritime flows, which - with East Asia being the new economic epicenter of the world - poses major logistical challenges for those states on the opposite side of the world, like Brazil.

The map below, centered on the Pacific Ocean, shows the main international maritime transport routes. The stronger the red color, the greater the intensity of trade flows. It can be seen that despite the great distances covered by the Pacific routes, this route connects the two most dynamic economic hubs in the world: the west coast of the United States (also involving Canada, Mexico and the Panama Canal) and, on the other side, China (involving Japan, South Korea, Taiwan and the Strait of Malacca).

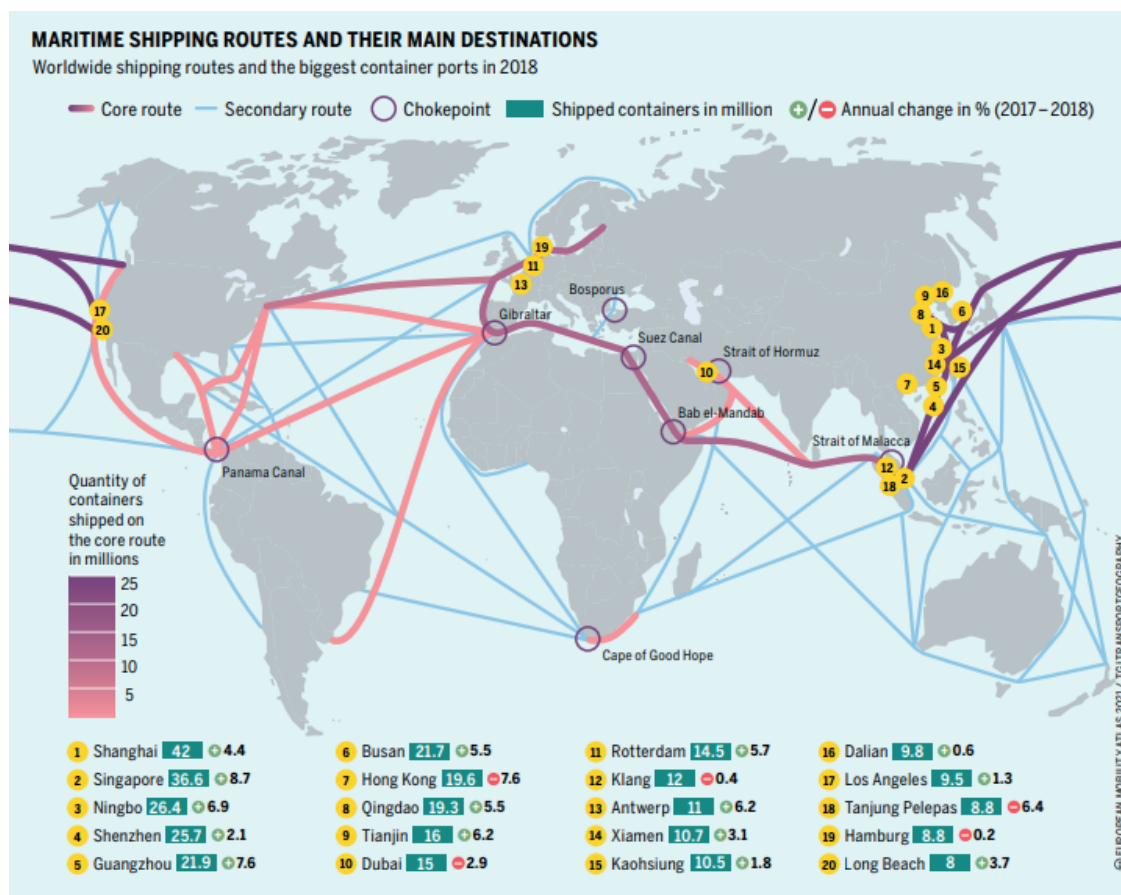


Figure 1 - MARITIME NAVIGATION ROUTES AND THEIR MAIN DESTINATIONS: World maritime routes and the largest container ports in 2018 (Heinrich-Böll-Stiftung, 2021). Available at: <https://eu.boell.org/sites/default/files/2021-07/EUMobilityatlas2021_2ndedition_FINAL_WEB.pdf>. Accessed on March 30, 2023.

The European Mobility Atlas map also shows the location of the 20 largest container destination ports in the world, listed in the table below. It shows that of the 20 largest ports in the world, 9 are in China, and 7 of the 10 largest are also in China. If we consider the ports in East/Southeast Asia, 14 of the 20 largest ports are in this part of the ocean.

1	Shanghai	China	11	Rotterdam	Netherlands
2	Singapore	Singapore	12	Klang	Malaysia
3	Ningbo	China	13	Antwerp	Belgium
4	Shenzhen	China	14	Xiamen	China
5	Guangzhou	China	15	Kaohsiung	Taiwan
6	Busan	Coreia do Sul	16	Dalian	China
7	Hong Kong	China	17	Los Angeles	USA
8	Qingdao	China	18	Tanjung Pelepas	Malaysia
9	Tianjin	China	19	Hamburg	Germany
10	Dubai	UAE	20	Long Beach	USA

Table 1 - List of the 20 largest ports in the world in terms of container throughput. Own elaboration, based on data from the European Mobility Atlas, 2021.

By analyzing import, export and main trading partner data in the Observatory of Economic Complexity (OEC) system, we find empirical evidence of the dominance of the Pacific in the current maritime scenario, and the fact that China is already South America's largest trading partner as a whole. And, looking at each country individually, it is already the largest trading partner for Brazil, Uruguay and Venezuela on the Atlantic side, and Chile and Peru on the Pacific. The only reason China isn't also Argentina's biggest trading partner is because Brazil still holds (in 2021) that position. In the northern part of South America, the United States (which considers this region its strategic surroundings, the "Greater Caribbean") is still the largest trading partner of Colombia, Ecuador and Guyana (OEC, 2022).

South American countries' biggest trading partners in 2021

OEC - 2021		Exports				Imports			
		1st		2nd		1st		2nd	
1	Brazil	China	30,60%	USA	10,50%	China	23,90%	EUA	17,40%
2	Argentina	Brazil	16,30%	China	8,64%	China	20,90%	Brazil	19,70%
3	Chile	China	38,10%	USA	15,70%	China	30,90%	EUA	17,80%
4	Colombia	USA	27,50%	China	8,67%	China	25,40%	EUA	24,50%
5	Peru	China	31,20%	USA	13,10%	China	29,40%	EUA	19,90%
6	Ecuador	USA	23,80%	China	14,80%	China	23,80%	EUA	20,70%
7	Venezuela	China	26,30%	Turkey	14,10%	China	31,00%	EUA	22,00%
8	Uruguay	China	28,80%	Brazil	16,50%	China	19,80%	Brazil	17,80%
9	Bolivia	India	16,40%	Brazil	12,80%	Brazil	19,60%	China	19,20%
10	Paraguay	Brazil	33,10%	Argentina	24,60%	China	29,50%	Brazil	23,37%
11	Guyana	USA	39,70%	Singapura	14,30%	Singapore	33,20%	EUA	18,50%
12	Suriname	Switzerland	51,10%	UAE	22,20%	EUA	19,00%	China	16,10%

Table 2 - South America's main trading partners in 2021. Own elaboration, based on data from the Observatory of Economic Complexity. Available at: <<https://oec.world/>>. Accessed on March 30, 2023.

The scenario for 2021, when compared to 20 years ago in the table below, in 2001, demonstrates how quickly South America's trade relations have changed. It is clear that the continent now has China as its main economic partner, to the detriment of the USA, which remains an important partner, in second place. It should also be noted that despite also losing positions, Brazil remains the third largest economic partner of South American countries.

South American countries' biggest trading partners in 2001

OEC - 2001		Exports				Imports			
		1º		2º		1º		2º	
1	Brazil	USA	24,6%	Argentina	8,0%	USA	24,9%	Argentina	10,0%
2	Argentina	Brazil	21,3%	USA	11,3%	Brazil	25,0%	USA	20,0%
3	Chile	USA	18,6%	Japan	12,1%	USA	19,8%	Argentina	17,1%
4	Colombia	USA	42,9%	Venezuela	12,7%	USA	34,9%	Venezuela	6,7%
5	Peru	USA	24,5%	UK	13,0%	USA	24,1%	Chile	8,2%
6	Ecuador	USA	33,7%	Colombia	6,4%	USA	25,8%	Colombia	11,7%
7	Venezuela	USA	55,3%	Neth. Antilles	5,4%	USA	33,1%	Colombia	8,9%
8	Uruguay	Brazil	20,3%	Argentina	13,5%	Argentina	20,3%	Brazil	17,1%
9	Bolivia	Brazil	21,7%	USA	12,6%	Brazil	18,7%	Argentina	18,7%
10	Paraguay	Brazil	53,6%	Argentina	11,8%	Brazil	25,5%	Argentina	23,8%
11	Guyana	USA	28,6%	Canada	22,5%	USA	29,7%	Trinidad and T.	17,9%
12	Suriname	USA	25,7%	Norway	17,8%	USA	27,8%	Trinidad and Tobago	22,1%

Table 3 - South America's main trading partners in 2001. Own elaboration, based on data from the Observatory of Economic Complexity. Available at: <<https://oec.world/>>. Accessed on March 30, 2023.

It is noteworthy that in the two South American countries without access to the sea, Bolivia and Paraguay, China is less important as a trading partner compared to the other countries, especially in terms of exports. Based on this finding, we can construct a hypothesis – to be verified – that the lack of maritime access and port infrastructure in these countries leaves them more economically distant from the largest buyer of products sold by South American countries.

As well as being one of the main trading partners in South America, Brazil has a surplus trade balance with all the countries on its continent. And even though it is the largest economy in Latin and South America, its participation in international trade is small, at around 1% of total world exports and imports.

It is therefore clear that the quest for economic growth and development and greater international integration of the South American states is a common and long-standing objective in the region, the path to which necessarily involves deepening regional integration in order to expand the common economic territory and intertwine national markets in a balanced way, with gains in scale and productive complementarities.

However, for this to happen, there needs to be a material infrastructure base to physically connect the states on a continent where logistical flows have always been characteristic of economies that export abroad (from South America) and proportionally establish few regional trade exchanges.

Brazil is currently heading towards a maritime dilemma: at the same time as its territorial expansion, economic interests and maritime institutional efforts are projected eastwards into the exclusive economic zone (EEZ) in the Atlantic Ocean, the world is increasingly turning westwards, in the opposite direction, towards the Pacific Ocean. It is striking that the functioning of South America's international regional integration bodies seems to reflect this movement, as if each side of the continent were uncoordinatedly splitting into at least three parts, each turning its back on its neighbors and focusing its gaze on its ocean and beyond. The emptying and/or cooling of South American forums, such as the Union of South American Nations (UNASUR) and the Southern Common Market (Mercosur), contrasts with the expansion and emergence of forums with a new logic and objective, which seek to integrate only a few countries in the Americas with Asia, and make explicit in their names the Ocean they consider strategic, such as the Asia-Pacific Economic Cooperation (APEC), the Trans-Pacific Partnership (TPP), and the Pacific Alliance.

It's only fair to make a parenthesis to point out that South America's low level of integration is due to a few non-trivial factors. Firstly, the demographic density of South America is only around 20 inhabitants/square kilometer, while Asia has around 100 and Europe 73 inhabitants/square kilometer, resulting in large portions of "population voids".

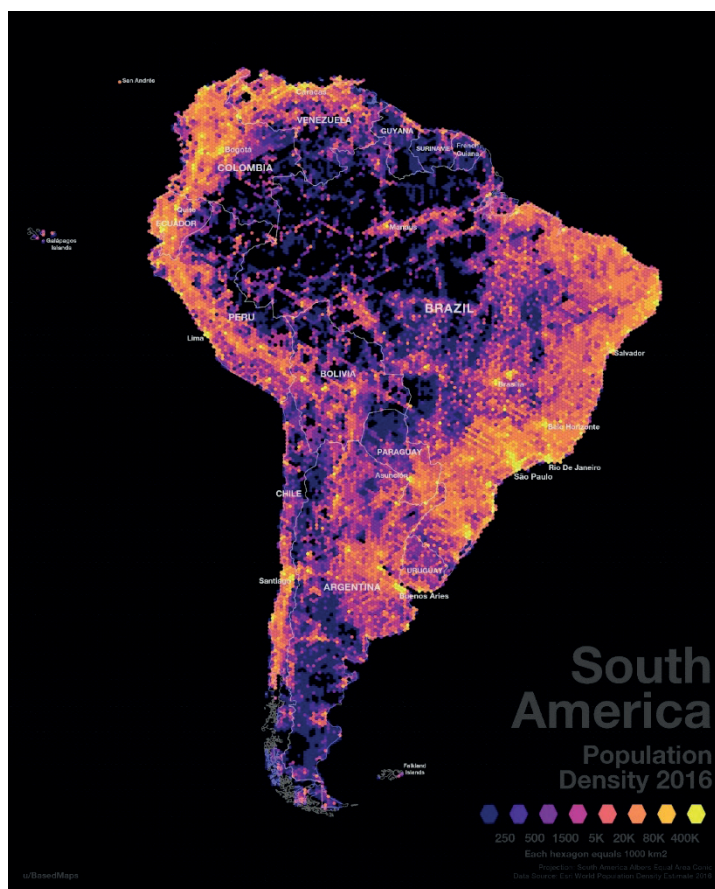


Figure 2 - Population density map of South America in 2016. Available at: <https://www.reddit.com/r/MapPorn/comments/im8izn/south_america_population_density_2016/?utm_source=dlvr.it&utm_medium=twitter> Accessed on March 30, 2023.

Secondly, the colonial occupation of the Iberian empires prioritized settlements in coastal territories, both because of the geographical difficulty of moving inland, and because of the military control associated with naval power as the mainstay of their domains and the range of artillery used by their ships. The establishment of towns and cities far from the coast was discouraged or even forbidden in the colonies, because in the event of attacks by indigenous people, revolts by independentists or enslaved people, for example, their navies would have no counter-attack capacity and would be forced to carry out landing operations, increasing the vulnerability of the troops and rendering useless the firepower of the ships, which were veritable floating fortresses with hundreds of artillery pieces.

Thirdly, the topography, as geographical accidents discouraged the colonizers from moving away from the sea. These include the Andes mountain range, an almost insurmountable natural barrier that spreads mountain ranges and high-altitude deserts throughout the western part of South America, isolating the Pacific coast from the rest; the Amazon, a dense, rainy and floodable forest that occupies almost 40% of South American territory and is an immense region that is difficult to populate and cross. Added together, the Amazon and Andes plus Patagonia, the Pantanal and the Brazilian semi-arid, which are regions where the construction of transport and integration infrastructures tends to be more difficult and costly, add up to 70% of the continent's area.

These characteristics practically blocked inland occupation in the north of the continent and slowed it down in the center and south. Furthermore, it is important to remember that the two most central states in South America, Bolivia and Paraguay, were defeated in wars that ruined their economies, lost important parts of their territories, reduced their economically active populations, and further compromised the development of the central continental region, such as in the Paraguayan War (1864-1870), the War of the Pacific (1879-1883), and even fighting each other in the most lethal war in South America in the 20th century, the Chaco War (1932-1935).

However, the central South American region is experiencing a new moment of international stabilization and economic prosperity, mainly driven by agricultural, mining and hydrocarbon production, which is geared towards exports. From the founding of Brasília (1960) to the inauguration of the Itaipu binational hydroelectric plant (1984), there has been an expansion of an infrastructure, logistics and services network that has accelerated the process of occupying the interior. The application of technologies to fertilize the cerrado soil, characterized by its acidity and poverty of minerals, made it possible for the agricultural frontier to advance towards the West. (SENADO, 2022) The Midwest region of Brazil received migratory fronts of producers from the South and Southeast, contributing to the settlement, even crossing the border, with the significant immigration of Brazilian producers to the border region with Paraguay.

In the 21st century, the Brazilian Midwest is emerging as one of the main focuses of economic growth due to the production and export of soybeans, the main product on the Brazilian export list. China alone bought 79% of Brazil's soybeans in 2019 (BUENO, 2022), and around 70% of Brazil's soybean production area is concentrated in the three Midwestern states of Mato Grosso, Goiás and Mato Grosso do Sul. (COMPRERURAL, 2020) The middle of South America has become the epicenter of a new primary export economic cycle, and both soybeans and other products from there mostly go to Asia, being shipped through Brazilian ports in the Atlantic, mainly through a few ports in the Southeast such as the Port of Santos, the Port of Rio Grande and the Port of Paranaguá, which together account for 67.5% of Brazilian soybean shipments, according to the Strategic Territorial Intelligence System of Brazilian Agricultural Macroeconomy (2022).

3. THE NEW TRANSPORT INFRASTRUCTURES IN SEARCH OF THE PACIFIC

All developed economic territories are characterized by a common reality: they have a tangle of overlapping and interconnected networks of various types of infrastructure. Whether in the European Union, the United States, China or Japan, for example, there are dense networks of roads, railroads, waterways, pipelines, canals, ports, airports, power stations, power generation equipment and plants and transmission networks, submarine cables, telecommunications towers and systems, satellites, radars, lighting, water treatment and supply networks and basic sanitation, solid waste treatment, among many others.

The market - a theoretical abstraction that represents a complex system of economic interactions - exists under this material base of interconnected infrastructure networks, and its functioning is conditioned by the way the population is established and distributed over it. And the way this network is organized, and whether or not it is balanced, affects the quality of its functioning. If this infrastructure network, even if it is cut up by national borders and geographical accidents, operates as an integrated and dynamic system, the faster and more standardized its connections, the better the reach of its offers and the greater the chances of its demands being met in its circuit. In other words, a well-developed market necessarily requires good infrastructure.

In practice, this would mean, for example, a hypothetical producer located in country/state "A" being able to offer their product/service more easily, quickly and cheaply in country/state "B" due to new connections that have been made as a result of investments in building infrastructure, especially logistics, which have given demand and supply, which previously did not meet, the opportunity to do so. Thus, the deepening of the market is directly favored by the expansion of the infrastructure network.

Each country in South America has its own network of transport infrastructure and specific needs for expanding and improving them, however, for the purpose of this chapter, the specific type of transport infrastructure chosen is that which is capable of connecting two different oceans, in the case of South America, the interoceanic road and rail corridors between the Pacific and Atlantic.

There isn't just one route that connects the oceans in South America. Since the beginning, before European colonization, there have been routes such as Peabiru path, which connected the coasts of the states of São Paulo and Santa Catarina to Cusco (Inca Empire) via trails and rivers, and to the coast of Peru, passing through Asunción in Paraguay. And over the last few decades different proposals for interoceanic routes have emerged, each with a different route, layout and mode of transport. Some of these proposals were just ideas, others became projects and had more in-depth studies, but none of them actually came to fruition due to different contexts and reasons.

The Brazil-Peru Transcontinental Railroad, "a project that has existed since 2008, but only in 2015 did it gain more space in the political discussion" (FARIA and GOMES, 2017) was a railroad of around 5.000 km proposed by the Chinese company China Railway Eryuan Engineering Group (Creec). The railroad would originally start at the port of Açu, in Rio de Janeiro, pass through Minas Gerais, Goiás, Mato Grosso, Rondônia and Acre until it reached the Peruvian border, crossing the Amazon and the Andes to the Pacific port of Bayovar. Its route through national territory would connect "the soybean and ore hubs to a

network that would make it possible to transport production across both oceans, depending on which market it was exported to” (VALEC apud FARIA and GOMES, 2017). Even though some feasibility studies had been carried out, after a series of questions about route variants, environmental impacts, which stretches would be started first and the financing model, the project was discarded in 2018.

Another project, this one led by Bolivia, which wanted to avoid being excluded from an interoceanic link, was the Central Bioceanic Railway Corridor (CFBC). Its route would connect São Paulo, Campo Grande, Santa Cruz de la Sierra, La Paz, Ilo, Matarani-Arica-Iquique. The project gained greater visibility in 2017 and could be financed by a Chinese bank. One of the alleged advantages of the proposal was that most of the railroad sections would already be in place, requiring the reconstruction of old sections and the construction of new ones. The project was not canceled, but alternative proposals articulated by neighboring countries with projects that do not pass through Bolivian territory gained more strength (FERREIRA, 2019), and the internal political instability in Bolivia in 2019 ended up contributing to putting the CFBC on the back burner.

To the south of the continent, the Paranaguá-Antofagasta Railway is another project that has been reappearing sporadically in the public debate. The interoceanic railroad would pass through the state of Paraná, in Brazil, and through Paraguay and Argentina, ending in Chile. A study carried out by the National Bank for Economic and Social Development (BNDES) in 2011 compared the possibilities of interoceanic rail routes and concluded that it is the priority project to make the rail connection that “[...] could be appropriated by both primary-export interests and those that revolve around industrialization and adding productive value.” (OLIVEIRA, 2011)



Figure 3 - Map of the Antofagasta-Paranaguá railroad route. Available at: <<https://viatrolebus.com.br/2020/05/3-projetos-de-ferrovias-na-america-do-sul-que-ligariam-o-atlantico-e-o-pacifico/corredor-bioceanico-web/>>. Accessed on March 30, 2023.

This proposal has the advantage of already having most of the route ready, with only a new stretch of railroad to be built between Cascavel and Resistencia. In 2022, the ACIFI (Commercial and Business Association of Foz do Iguaçu), sponsored by Itaipu Binacional, held the International Forum on Sustainable Multimodal Logistics - Capricorn Bioceanic Corridor, with the aim of developing joint actions between the countries of the region and promoting logistics projects and investments. The forum brought together representatives from Brazil, Paraguay, Argentina and Chile and working groups were formed to further study the project, which also has the support of the Mercosur Parliament (Parlasur). However, despite the project's great potential, there are still no clear definitions about investments, financing, execution and deadlines for the start of construction and operations (PREZEPIORSKI, 2023).

Finally, there is an interoceanic railroad project between Buenos Aires in Argentina and Santiago in Chile. The project would revive the old Ferrocarril Trasandino Los Andes-Mendoza, a railroad that connected the two countries between 1910 and 1984 (LOBO, 2020).

All of these rail projects would require billion-dollar investments in the construction of entire new stretches of railroad and the refurbishment or reactivation of existing stretches that are underused or abandoned. Investments would also be needed to standardize the track gauge, modernize the rails, change the sleepers, and build and expand marshalling yards. Despite the high initial investments, rail options would have an advantage over road in terms of their ability to transport large volumes of cargo, with lower operating costs per ton transported, lower pollutant emissions and greater safety for cargo and carriers.

There are currently road connections, so it is possible, for example, for a vehicle to leave Santos, pass through Campo Grande and reach Antofagasta. However, the journey is difficult because a significant part of the roads - especially in the Paraguayan Chaco and the Argentine and Chilean Andes - are unpaved and impassable for heavy vehicles, and there is still no border bridge linking Porto Murtinho, in Mato Grosso do Sul, to Porto Carmelo Peralta in Paraguay, making it necessary to turn south via Ponta Porã and Concepción, which is almost 300 km longer than a route with the bridge.

The work by Padula and Barros (2021) presents and evaluates the projects of a series of works listed mainly through the portfolios of the Initiative for the Integration of South American Regional Infrastructure (IIRSA), which aim to create connection routes between the state of Mato Grosso do Sul and the Pacific Ocean. In general, the road projects are more advanced than the rail projects, one of which is a highway linking Brazil (through Mato Grosso do Sul), Paraguay, Argentina and Chile, and the other, a highway linking Brazil (through Mato Grosso do Sul), Paraguay, Bolivia and Chile.

In both road options, most of the routes from the Atlantic to the Pacific already exist, but there are several intermediate stretches that need to be built or improved, making for a more direct latitudinal highway between the two oceans. The countries involved in these road routes are carrying out work to make it feasible, and it should be an available reality in the next few years. In the case of the road route between Santos and Antofagasta, some of the work on the project has already been completed, others are underway or have not yet begun. The government of Mato Grosso do Sul has made political and institutional efforts to promote the route. In 2022, the 1st Forum "The Integration of the Municipalities of the Bioceanic Corridor" was held in the Legislative Assembly of Mato Grosso do Sul, with various thematic panels and the participation of representatives and experts from all the countries involved.

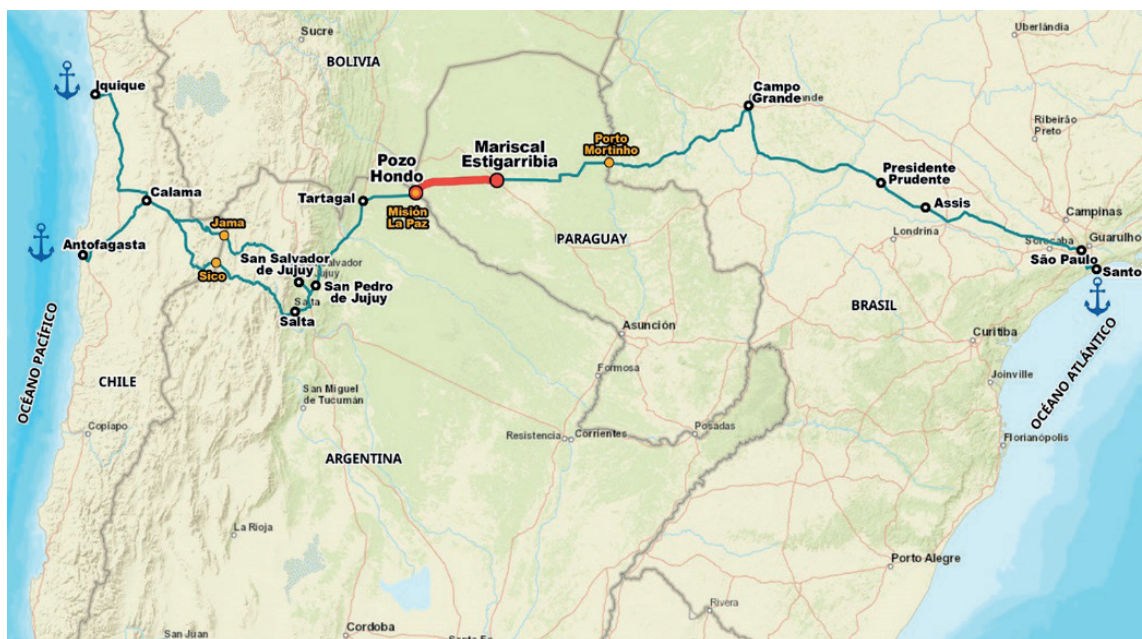


Figure 4 - Map of the road route of the Antofagasta/Iquique-Santos interoceanic corridor. The highlighted section refers to the project to improve and pave the PY-15 road, Mariscal Estigarribia-Pozo Hondo section, which is already underway, for US\$354, financed by FONPLATA. FONPLATA, 2020. Available at: <<https://www.fonplata.org/pt/noticias/21-12-2020/paraguai-fonplata-financia-projeto-chave-para-concretizacao-do-corredor-bioceanico-regional>>. Accessed on March 30, 2023.

In addition to land transport, there are several other projects to improve the navigability of the waterways in the River Plate Basin, including dredging, the construction of locks, and the expansion or construction of river ports and terminals. There is great potential to expand the length and capacity of the waterways for intra-regional transportation in the River Plate Basin,

and their current importance lies mainly in the possibilities of intensifying multimodality, since transshipment terminals from the waterway to the rail and road modes create a large integrated logistics network that tends to increase the supply of freight, the possibilities of routes, and efficiency with greater use of return freight. Since Brazil occupies a large portion of this central area, it can benefit not only from access to the Pacific, but also from expanding its economic territory inland.

The working groups that are still active from the Initiative for the Integration of the Regional Infrastructure of South America (IIRSA) projects consider all the projects in an articulated manner, promoting the creation of an interconnected, multimodal infrastructure network, like the one mentioned above. Thus, it is clear that the interoceanic route projects are not isolated interconnections that merely cross the territory from one side to the other but are axes that are part of a large regional integration infrastructure network. Several benefits could be highlighted.

[...] in a continent where countries have historically had their economies and national territories disjointed from each other and turned outwards, with a poor infrastructure system for intra-regional interconnections, the parallel bioceanic routes, by crossing the territories of different countries, would promote integration between their economies and markets, being a favorable agent for integration and increasing intra-regional trade between the countries involved. It could even promote integration and better national territorial occupation in the countries involved, which still lack infrastructure. (PADULA e BARROS, 2021, p. 62)

Thus, despite the recent cooling and lack of coordination between South America's international cooperation bodies, integration processes have advanced "from below", pragmatically encouraged by regional and national governments, and promoted by associations of local producers and exporters, with different financing and execution arrangements. The moves towards completing the projects indicate that infrastructure integration has advanced regardless of the support and attention of South American international forums, mainly due to the simple fact that exporters and importers are looking forward to have lower freight costs for their products, and local populations are demanding better infrastructure from their representatives because they know that this will affect the performance of the local economy and their capacity for mobility. "We can then see advantages in terms of costs, which would be even greater if waiting times in Santos, traffic jams, storage, etc. were taken into account" (PADULA and BARROS, 2021, p. 33).

Still about advantages in terms of transportation costs and time.

[...] The Brazilian state-owned company Empresa de Planejamento e Logística (EPL), which participates in the meetings of the Bioceanic Corridor, has carried out a series of studies on the positive impacts of the corridor, in terms of trade flows and cost reductions, considering transportation mostly by containers and focusing on products chosen from the existing trade flows of the Central-West and Northern regions of Brazil. Potential products for export from Brazil were: meat, processed and chilled foods, cellulose, cars, trucks and buses, footwear and clothing. For imports, it identified: electronic products, fertilizers, salt, fish, dairy products, processed foods, and wines and olive oils. The Corridor's potential connection markets mainly cover Asia, Oceania and the West Coast of the Americas (including North America) (PADULA and BARROS, 2021, p. 63)

4. CONSIDERATIONS AND PERSPECTIVES ON INTEGRATION IN SOUTH AMERICA AND MARITIME SECURITY AND DEFENSE

The operation of the interoceanic routes will have an impact on cargo handling at Brazilian ports since they come into operation. It is possible to draw a hypothetical future scenario in which there are one or more interoceanic routes in South America, and that these establish themselves as better and cheaper alternatives for Brazilian exporters and importers.

So, on the one hand, the use of ports in the Pacific will mean a detour of cargo from Brazilian ports. This situation, in a pessimistic scenario, could represent a logistical relief by reducing the overload of the main Brazilian ports, if there is no investment in infrastructure. But in general, it represents the emptying of these ports, and the consequent income it adds, and the emergence of competition that could become very relevant considering the change in the trade axis to the Pacific.

On the other hand, the routes could increase regional integration with a more efficient South American infrastructure, boosting trade between countries and potentially generating simpler regulations for trade facilitation and the creation of dry ports. In this case, regional development is favored, integrating Central South America with the Oceans, creating logistical alternatives and lowering costs.

In both situations, in addition to the directly related economic and social issues, security and defense issues take on new contours. In terms of public security, the opening up of new trade routes brings with it a whole range of crimes and transgressions that try to take advantage of the logistical infrastructure to reach their markets, in much the same way as happens with undertakings that are backed by legality and ethics.

The authorities must therefore be attentive to these developments so that, with the emergence of new transport infrastructures, security infrastructures are also created. The states involved must therefore promote the development of border posts suitable for customs control, migration, health issues and federal police posts. A reactive stance in this case may find criminal structures already established, requiring more intense repressive actions to restore full order. In the case of a proactive stance, developments tend to be smoother, without major impacts.

In the case of the Defense of Maritime Lines of Communication (LCM), we will also have to think about how to guarantee the security of the country's trade when the ports responsible for part of the trade will be in Pacific waters. Will the Navy have the capacity to defend the LCM in the Pacific? Will this be part of its strategy or, due to limited resources, will it stick to national ports and the waters of the Blue Amazon? Will there be a need to rethink new agreements with Chile, Peru and Ecuador in terms of cooperation between navies?

Issues like these, if dealt with in advance, can allow alternatives to be considered before a possible problem arises, cooperation and solutions to be maximized by taking advantage of the development of the interoceanic routes, and public bodies to work together on solutions that will benefit society as a whole, preventing opportunistic ventures that could benefit a few interested parties to the detriment of the national development of the countries involved.

In terms of the Brazilian Merchant Navy, the shift of Brazilian trade to foreign ports could have a very negative impact if solutions are not found for this possible change in maritime traffic, or it will be necessary to assess how the bioceanic routes could help Brazil consolidate itself as a true integrating maritime platform in the South Atlantic, where there is potential for a large and modern Brazilian Merchant Navy, together with a system of ports, to expand as the necessary transport infrastructure to expand economic relations with all the countries in its strategic surroundings, mainly on the west coast of Africa and Latin America, areas that have great potential for growth and the formation of a regional maritime market, and which are little explored and neglected by the large oligopolies of current shipowners (mainly European and Asian companies) who establish few or no routes between these countries and concentrate a high degree of control over the determination of routes, shipping conditions, deadlines and pricing of services, and place the owners of South American cargoes in a submissive and dependent position.

[...] Brazil, by failing to give adequate priority to maritime activities, failing to develop a naval force and a strong merchant navy, has increased the difficulties for its development and, consequently, for the full fulfillment of national well-being. On the other hand, [...] control of the seas has, throughout history, been a decisive factor in all wars. [...] This argument stems from the understanding that “whoever controls the exchange controls the wealth and whoever controls the wealth controls the world”. (BARBOSA JUNIOR, 2012, p. 210)

Another important issue in the “Knowledge Age” is how logistics control systems and information-sharing protocols will be integrated with the new routes. Currently, the effort to integrate Brazilian agencies and share ship information is quite considerable, with a view to increasing control over cargo, maritime security, and national defense. Considering a possible new reality of international cargo transportation through dry borders, would current controls be maintained unchanged, or would there be a need to expand and improve these capabilities? Would there be land-based e-navigation? Cybercrime cannot be left out of this issue.

It is therefore necessary to assess how Brazil can adapt and make investments both to meet the logistical needs of export and import flows, and to improve national transport systems, especially waterway, cabotage and long-haul navigation, using national vessels and crews, especially prioritizing the Brazilian naval industrial complex. Because “the strengthening of the port system, modal systems, with increasing integration of waterways into robust logistical matrices indicate that we are implementing oceanopolitical concepts in national development” (BARBOSA JUNIOR, 2012, p. 231).

A relevant issue that uses logistics as a tool is the shift of the Axis of Power from the Atlantic to the Pacific and the possible economic and political disputes resulting from the disputes between the US and China. This situation is much broader than the issue of transoceanic routes, but they can play a fundamental role in providing Brazil with logistical alternatives. Contrary to what some people think, these alternatives appear as opportunities to expand national power and negotiating capacity. However, if they are not strategically thought out, they can become weaknesses to be exploited by parties opposed to their interests. In this second case, one of the worst weaknesses is the lack of public policies and strategies for the sector.

5. FINAL REMARKS

History shows that maritime trade and its routes evolve according to the demands of societies and the world's centers of power. Nowadays, the Pacific Ocean is seen as the main environment for trade by sea as a result of the growth of Southeast Asia and, above all, China.

On the other hand, the growth of Brazilian agribusiness and the development of the Midwest has led to the search for more efficient and less costly transportation solutions to move cargo to China. Associated with this, the region's development demands greater trade flows and as is well known and seen, these flows come from the sea. These demands put pressure on the Brazilian port sector to be more efficient and to look for alternatives in Pacific ports. This economic and social pressure is reviving old South American integration projects, and their realization seems to be inevitable; it remains to be seen how soon it will happen and which of the initiatives will be most successful.

The various consequences of making the transoceanic routes a reality can be exploited as opportunities if the public authorities take initiatives, or they can become problems to be solved if nothing is done. This chapter has been too short to highlight all these aspects, but we have been able to draw attention to some of the economic, customs, health, regulatory, public security, and defense issues that need to be addressed in the debates and initiatives on the subject.

Economic and maritime issues will be strongly affected. The emptying of ports and the evasion of revenue is a possibility, but on the other hand, "competition from the Pacific" can generate improvements with increased efficiency and maritime infrastructure to meet the growing volume of trade. And the role of the Merchant Navy in this context should not be forgotten.

Security and defense issues in a world that is undergoing intense transformation must be carefully considered and considered when drawing up strategies, with the need for the state to position itself so that the alternatives created are not exploited as weaknesses by antagonistic entities and can be used as opportunities by governments and society. The inclusion of the issue in oceanopolitics and geopolitics is rich for promoting strategies for the positioning of the state in relation to these initiatives, cooperation, and integration in South America.

Finally, the situations presented in this chapter provide a few warnings about a subject that calls for an articulating state, promoting debates and integration policies with both national and international public and private entities, especially South America's neighbors. A proactive stance could generate synergy between those involved, increasing efficiency, and generating social and economic development for all.

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