

# Oil exploration in the Brazilian Equatorial Margin and its impact to the National Defense

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## Executive Summary

The Brazilian Equatorial Margin, which stretches from the coast of Rio Grande do Norte to Amapá, has a high potential for oil exploration, estimated at billions of barrels of oil. However, its exploration raises critical points related to national defense, involving discussions about the protection of sovereignty, energy security, and environmental preservation. The region is situated within two fundamental strategic domains: the Legal Amazon and the Blue Amazon, both targets of external threats and internal vulnerabilities that demand integrated and effective public defense policies. The oil exploration on the Equatorial Margin requires increased monitoring of offshore infrastructure, i.e., marine environments, prevention of environmental threats, and strengthening sovereignty over the continental shelf. The growing presence of foreign vessels and illegal activities in the region also increases the need for surveillance and cooperation between defense and security agencies. In the context of the Legal Amazon, oil exploration can generate environmental impacts in sensitive biomes, affecting traditional populations and essential water resources. Furthermore, there are concerns regarding international pressure and potential sanctions should there be failures in the environmental management of the activity, which requires a strong diplomatic stance from Brazil. In the Blue Amazon

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region, energy security takes center stage, given that exploration in the Equatorial Margin can reduce dependence on imports and strengthen the country's energy autonomy. However, protecting offshore platforms against cyberattacks, environmental accidents, and acts of sabotage becomes a key challenge for the Ministry of Defense. This policy paper examines the implications of oil exploration in the Equatorial Margin for national defense, addressing geopolitical, environmental, and energy aspects. The analysis considers the role of the Armed Forces in the region's security and presents recommendations to mitigate risks and maximize opportunities for sovereign and sustainable development. Among other measures, the proposal includes strengthening the military presence in the region, developing and improving infrastructure for responding to environmental emergencies, strengthening governance, particularly in energy security policy, and improving Brazil's diplomatic strategy in the sector.

**Keywords:** equatorial margin; oil and gas; energy security; environmental management; Amazon.

## 1 OIL AND GAS IN THE EQUATORIAL MARGIN

The Brazilian Equatorial Margin is a coastal strip located in the north and northeast of the country, encompassing the coastal area between the states of Amapá and Rio Grande do Norte. As can be seen in Figure 1, this region includes five sedimentary basins of great importance: The Amazon River mouth, Pará-Maranhão, Barreirinhas, Ceará, and Potiguar regions are all recognized for their significant potential for oil and natural gas exploration (INSTITUTO BRASILEIRO DE PETRÓLEO, 2025).

From a geopolitical and environmental perspective, the Equatorial Margin occupies a unique position, as it is located at the confluence of two strategic spaces for Brazil: the Legal Amazon, in the continental territory, and the Blue Amazon, which includes the territorial sea, the exclusive economic zone (EEZ) and the extended continental shelf in the Atlantic. In this context, potential oil and gas exploration and production activities in the Equatorial Margin raise debates about possible impacts on both the Amazonian biome, recognized for its biodiversity and global climate relevance, and marine ecosystems. Such discussions remain open, pending in-depth technical studies to assess the extent and nature of these effects. Although there is no consensus on the magnitude of these potential impacts, the issue is relevant because it involves not only

environmental preservation, but also national sovereignty over sensitive natural resources.

In recent years, the region has attracted increasing interest from energy companies and the Brazilian government, motivated by geological characteristics similar to those observed in the basins of Guyana and Suriname, countries that together have already identified reserves exceeding 13 billion barrels of recoverable oil (SERVIÇO GEOLÓGICO DO BRASIL, 2024), which refers to the volume of oil that can be extracted from an underground reservoir in an economically viable way and with the available technology. Preliminary studies by the Energy Research Company (EPE) indicate that the Amazon River mouth has similar conditions, with approximately 6.2 billion recoverable barrels, which reinforces expectations regarding its productive potential (EPE, 2024).

Figure 1 shows the location of this region, presenting the basins of the Brazilian Equatorial Margin.

**Figure 1** – Basins of the Brazilian Equatorial Margin



Source: Antunes (2023).

In addition to the possibility of significantly expanding national oil and gas production, exploration in the Equatorial Margin represents an opportunity to strengthen the country's energy security, reduce dependence on imports, and generate economic development in the North and Northeast regions. However, this progress also brings


significant challenges, both from an environmental standpoint – given the sensitivity of the ecosystems involved – and in terms of governance, oversight, defense, and protection of critical infrastructure associated with the energy production chain.

According to some entities and organizations, oil exploration on the Equatorial Margin involves significant environmental risks, especially due to the proximity of areas of high biodiversity, such as Amazonian reefs, estuaries, and mangroves, which play a crucial role in climate regulation and the maintenance of ecosystem services. News has been circulating regarding possible accidents, such as oil spills, that could cause irreversible impacts on marine fauna, coastal communities, and the biomes of the Blue Amazon and the Legal Amazon themselves (Associação[...], 2025; WWF BRAZIL, 2023).

Cordeiro's work (2023), which analyzed a series of environmental studies prepared within the scope of environmental licensing processes for exploratory oil activity in the equatorial margin basins, indicates that, although the projects analyzed are located in areas distant from the coastline, the zones of influence associated with drilling activities can cover tens of kilometers and reach several coastal municipalities. The analysis of potential impacts in accidental scenarios revealed the possibility of effects that extend beyond the limits of national jurisdiction, with the potential to reach the territories of neighboring countries.

In geopolitical terms, the intensification of resource exploration in the equatorial margin entails risks to national sovereignty, especially given factors such as increased maritime traffic, the heightened interest of foreign actors in strategic resources, and the vulnerability of critical offshore infrastructure, which may be targeted by cyberattacks, sabotage, or transnational crimes.

Although it is impossible today to accurately determine the occurrence of these risks, there are precedents and technical and academic literature that demonstrate how similar scenarios have already been considered in other contexts: for example, the U.S. Government Accountability Office report (United States, 2022) on cyber risks to offshore oil infrastructure, as well as the study by Kashubsky (2011), which shows how oil platforms are considered attractive targets for attacks due to their potential for damage in different areas. These cases reinforce the idea that, even if only speculatively, such risks are legitimate and require the Brazilian State to proactively consider strengthening its presence and coordination between the defense, environmental enforcement, and active diplomacy sectors.



Thus, the country's strategic robustness depends on policies and capabilities that anticipate threats and preserve sovereignty over the Blue Amazon and the Brazilian jurisdictional waters.

Discussions regarding oil exploration in the equatorial margin require an integrated approach that combines rigorous environmental criteria and effective governance mechanisms in order to mitigate risks and maximize economic and social benefits. In this context, it becomes necessary to assess its implications for national defense, especially with regard to defense capabilities and the protection of Brazil's sovereignty.

## **2 IMPLICATIONS FOR THE DEFENSE**

Oil exploration in the Equatorial Margin poses substantial challenges to the security and defense of Brazilian territory, especially regarding the protection of offshore infrastructure, maritime traffic, and the logistics chains involved in oil production and distribution. The growing presence of foreign vessels in the region, whether for commercial interests, illegal fishing, or other possible unauthorized exploitation of natural resources, requires strengthened surveillance and constant monitoring by the Armed Forces.

Defending Brazil's continental shelf and exclusive economic zone has become a strategic imperative, requiring investments in modernizing the Brazilian Navy's fleet, expanding its network of radars and sonars, integrating satellite surveillance systems, and strengthening the patrolling and rapid response capabilities of the Armed Forces. Furthermore, the need for protection against cyber threats is growing exponentially, given that attacks on control systems of offshore platforms could compromise production and generate severe environmental impacts. The remote location in deep waters, coupled with the need for real-time monitoring and control, means that offshore oil and gas assets potentially present a wider attack surface compared to other subsectors of the industry. This factor is particularly relevant considering that offshore production accounts for approximately 30% of global oil and gas production (Mohammed *et al.*, 2022).


Another aspect relevant to national defense is the intersection between energy security and territorial security. Increased exploration in the Equatorial Margin could help ensure the maintenance of independence from oil imports, making Brazil less vulnerable to fluctuations in the international market. Furthermore, the Ministry of Mines and Energy

points out that exploration in the region is essential to prevent Brazil from becoming dependent on oil imports again, ensuring energy security and boosting economic development (Brasil, 2025). However, the geographical location of this activity in a maritime border region reinforces the importance of a robust defense policy, focused on protecting critical facilities and ensuring the continuity of operations.

At the same time, oil exploration in this region demands greater cooperation between different government agencies, including the Navy, the Air Force, the Army, the Management and Operational Center of the Amazon Protection System (Censipam), the Federal Police, and the Brazilian National Petroleum Agency (ANP). Creating joint operational protocols and conducting incident response simulations, such as for oil spills or sabotage attempts, are necessary measures to ensure operational readiness.

Economic activity in the Equatorial Margin also impacts maritime security and requires a greater state presence to guarantee sovereignty and control over Brazilian jurisdictional waters. The increase in commercial and logistics vessel traffic creates vulnerabilities to transnational crimes such as smuggling, drug trafficking, and illegal fishing, making it essential to strengthen the capacity to monitor and repress illegal activities.

Additionally, the environmental dimension must be considered within the scope of national defense, since ecological disasters can compromise the social and economic stability of the region. Oil spills or accidents involving offshore platforms could severely harm marine ecosystems and coastal communities, requiring swift and effective responses from the Brazilian government. The study by Greenberg *et al.* (2016) analyzed findings from response exercises in oil spill cases. According to the authors, the capabilities needed to respond to emergencies can be organized into three complementary categories. The first corresponds to functional capabilities, of a technical and operational nature, directly associated with the execution of specific tasks during the response, such as spill containment, cleaning of affected areas, and issuing public alerts. The second refers to managerial capabilities, which encompass organizational and interpersonal skills, including leadership, decision-making, coordination, and communication – essential elements for coordinating teams and resources in different types and scales of disasters. Finally, a third category stands out, often neglected in practical guidelines, comprised of adaptive capabilities, which allow one to cope with unforeseen and dynamic scenarios. This set includes skills such as improvisation, flexibility, and the transfer of knowledge acquired from previous experiences, which is fundamental given the inherent uncertainty



that characterizes disaster situations. Thus, it is evident that the integration of contingency plans between the Armed Forces, environmental agencies, and companies in the oil sector must be improved to mitigate potential impacts.

The geopolitics of the Equatorial Margin must also be analyzed considering the interests of foreign powers in the region's strategic resources, as can be seen in the dynamics of countries that are already more advanced than Brazil in the exploration of the region: Guyana and Suriname (Redação, 2025). There is a potential impact on issues related to national defense due to tensions between Venezuela and Guyana, which intensified after the announcement by the US oil company ExxonMobil that the coast of the Essequibo region has great potential for oil and gas exploration (Silva, 2025). The debate between focusing on fossil fuels versus renewable energies in the global scenario may generate external pressures on Brazil regarding its oil exploration and commercialization policy. In this sense, the relationship between the subject presented and the area of defense demonstrates a need for action by the Ministry of Foreign Affairs on the topic, which adds to Nina's (2020) analysis regarding the importance of involvement in negotiations of so-called "energy diplomacy," essential to preserving sovereignty and national interests.

Finally, national defense in the context of the Equatorial Margin must encompass not only territorial and energy protection, but also infrastructure development and improvement, interagency cooperation, and ensuring environmental sustainability. The State's presence must be reinforced through continuous investments in personnel training, equipment modernization, and the expansion of strategic partnerships, ensuring that, should it proceed, oil exploration in the region occurs safely and in line with Brazil's interests.

### **3 RECOMMENDATIONS**

- Strengthening Satellite Surveillance and Monitoring Capabilities

Reason: The integration of advanced satellite and drone surveillance systems will allow for real-time monitoring of maritime and environmental activities in the Equatorial Margin. This enables rapid response to incidents, such as oil spills, and improves surveillance against external threats.

- Creation of an Interinstitutional Task Force for Energy and Environmental Security

Reason: Coordination between the Navy, Army, Air Force, Censipam, Federal Police, Ibama (Brazilian Institute of Environment and Renewable Natural Resources), and the National Petroleum Agency (ANP) will enable an integrated response to security and environmental protection challenges, ensuring that exploration occurs sustainably and under strict oversight.

- Development of Contingency Plans for Environmental Emergencies

Reason: Creating rapid response protocols for oil spills, structural failures on platforms, and natural disasters reduces environmental impacts and protects coastal communities, strengthening the resilience of operations in the Equatorial Margin.

- Development of Cyber Defense Programs focused on the Protection of Offshore Infrastructures

Reason: With the rise in digital threats, protection against cyberattacks on oil platforms and control systems is essential to prevent production disruptions and leaks of sensitive data.

- Enhancing Energy Diplomacy

Reason: Brazil's diplomatic efforts must be strengthened to ensure that exploration of the Equatorial Margin occurs under clear rules, preserving national interests in the face of external pressures and positioning the country as a key player in the governance of energy resources.

## REFERENCES

ANTUNES, Claudia. **Quando a maré dobrar, a mancha vai entrar: petróleo na foz do Amazonas**. Sumaúma, 03 Feb. 2023. Available at: <https://sumauma.com/quando-mare-dobrar-mancha-vai-entrar-petroleo-foz-amazonas>. Accessed on: 26 May 2025.

ASSOCIAÇÃO de funcionários do Ibama critica autorização do órgão para simulação da Petrobras na Margem Equatorial. **O Globo**, Brasília, 20 May 2025. Available at: <https://oglobo.globo.com/economia/negocios/noticia/2025/05/20/associacao-de-funcionarios-do-ibama-critica-autorizacao-do-orgao-para-simulacao-da-petrobras-na-margem-equatorial.ghtml>. Accessed on: 26 May 2025.

BRASIL. Ministério de Minas e Energia (MME). **MME defende importância da Margem Equatorial para impedir que Brasil volte a ser importador de petróleo.** Brasília, 24 Apr. 2025. Available at: <https://www.gov.br/mme/pt-br/assuntos/noticias/mme-defende-importancia-da-margem-equatorial-para-impedir-que-brasil-volte-a-ser-importador-de-petroleo>. Accessed on: 26 May 2025.

CORDEIRO, Ana Alice Rodrigues. **Análise dos impactos ambientais ocasionados pela perfuração de poços exploratórios de petróleo offshore na Margem Equatorial Brasileira com foco na bacia de Foz do Amazonas.** 2023. 100 f. Monografia (Bacharelado em Engenharia Ambiental) – Escola Politécnica, Universidade Federal do Rio de Janeiro, Rio de Janeiro, 2022. Available at: <http://www.repositorio.poli.ufrj.br/monografias/projpoli10041598.pdf>. Accessed on: 26 May 2025.

EMPRESA DE PESQUISA ENERGÉTICA (EPE). **Caderno de estimativas volumétricas da Bacia da Foz do Amazonas – Play Limoeiro.** Rio de Janeiro: EPE, 2024. Available at: <https://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/caderno-estimativas-volumentricas-da-bacia-da-foz-do-amazonas-play-limoeiro>. Accessed on: 26 May 2025.

GREENBERG, Brandon; VOEVODSKY, Paule; GRALLA, Erica. A capabilities-based framework for disaster response exercise design and evaluation: findings from oil spill response exercises. **Journal of Homeland Security and Emergency Management**, v. 13, n. 4, p. 20160034, 2016. DOI: <https://doi.org/10.1515/jhsem-2016-0034>. Available at: <https://www.degruyterbrill.com/document/doi/10.1515/jhsem-2016-0034/html>. Accessed on: 26 May 2025.

INSTITUTO BRASILEIRO DE PETRÓLEO (IBP). **Margem Equatorial: oportunidades e desafios para o desenvolvimento sustentável.** Rio de Janeiro: IBP, 2025. Available at: <https://www.ibp.org.br/personalizado/uploads/2025/04/21a-margem-equatorial.pdf>. Accessed on: 26 May 2025.

KASHUBSKY, Mikhail. **Offshore petroleum security: Analysis of offshore security threats, target attractiveness, and the international legal framework for the protection and security of offshore petroleum installations.** 2011. Thesis. University of Wollongong, Wollongong, Australia, 2011. Available at: <https://hdl.handle.net/10779/uow.27777531.v1>. Accessed on: 19 Aug. 2025.

MOHAMMED, Abubakar Sadiq; REINECKE, Philipp; BURNAP, Pete; RANA, Omer; ANTHI, Eirini. Cybersecurity challenges in the offshore oil and gas industry: an Industrial Cyber-Physical Systems (ICPS) perspective. **ACM Transactions on Cyber-Physical Systems**, v. 6, n. 3, art. 28, p. 1-27, July 2022. DOI: <https://doi.org/10.1145/3548691>. Available at: <https://dl.acm.org/doi/10.1145/3548691>. Accessed on: 26 May 2025.

NINA, Alexandre Mendes. **A diplomacia brasileira e a segurança energética nacional.** Brasília: Fundação Alexandre de Gusmão, 2020. (Curso de Altos Estudos).

Available at: <https://books.google.com.br/books?id=-y5ezwEACAAJ>. Accessed on: 26 May 2025.

REDAÇÃO REVISTA AMAZÔNIA. Enquanto o Brasil posterga, Guiana avança para segunda fase na exploração de petróleo na Margem Equatorial. **Revista Amazônia**, 27 Jan. 2025. Available at: <https://revistaamazonia.com.br/guiana-avanca-petroleo-margem-equatorial/>. Accessed on: 26 May 2025.

SERVIÇO GEOLÓGICO DO BRASIL (SGB). **Margem equatorial do Brasil terá mapeamento de alta resolução e novas pesquisas realizadas pelo Serviço Geológico do Brasil**. SGB, 10 May 2024. Available at: <https://www.sgb.gov.br/w/margem-equatorial-do-brasil-tera-mapeamento-de-alta-resolucao-e-novas-pesquisas-realizadas-pelo-servico-geologico-do-brasil>. Accessed on: 26 May 2025.

SILVA, Marcus Vinicius Gonçalves da. A disputa por Essequibo: perspectivas e impactos de um potencial conflito na América do Sul. **Revista de Segurança, Desenvolvimento e Defesa**, v. 1, n. 1, p. 8-31, 2024.

Available at: <https://rsdd.esd.gov.br/index.php/rsdd/article/view/13/5>. Accessed on: 26 May 2025.

UNITED STATES. Government Accountability Office (GAO). **Offshore Oil and Gas: Strategy Urgently Needed to Address Cybersecurity Risks to Infrastructure**.

Washington, D.C., 26 Oct. 2022. (GAO-23-105789). Available at: <https://www.gao.gov/products/gao-23-105789>. Accessed on: 19 May 2025.

WWF BRASIL. **No Maranhão, novo pré-sal ameaça a maior formação de recife de corais da América do Sul**. Brasília, 29 jun. 2023. Available at: <https://www.wwf.org.br/?86360/no-maranhao-novo-pre-sal-ameaca-a-maior-formacao-de-recife-de-corais-da-america-do-sul>. Accessed on: 26 May 2025.