Impacts of climate change on the security and defense of the Amazon: a strategic analysis

Received: 24 April 2025 **Accepted:** 20 July 2025

Paulo Ricardo de Oliveira Dias*

Executive Summary

This Policy Paper addresses the growing relevance of the intersection between the climate agenda and national security, focusing on the implications for the Brazilian Amazon. The region, vital for regulating the global climate and possessing vast natural resources, faces complex challenges stemming from extreme weather events, increased deforestation, and pressures on its resources. The upcoming COP30, to be held in Belém, Pará, in 2025, intensifies the urgency of debating environmental securitization and the need for coordinated actions to mitigate climate risks. The study analyzes how climate change amplifies vulnerabilities and instabilities in the Amazon, impacting food security, water availability, and political stability. Environmental degradation, driven by illegal activities such as mining and logging, exacerbates the situation, jeopardizing the biodiversity and ecological balance of the region. The analysis also considers the implications for national security, including regional instability, population displacement, threats to strategic infrastructure, and the intensification of cross-border criminal activities. Given this scenario, the objective of this work is to present general recommendations that will strengthen security and defense conditions in the Brazilian Amazon. The text structure comprises a detailed analysis of the problem, followed by a set of practical and feasible recommendations, based on the evidence that was the subject of research.

The main recommendations include: 1) strengthening the State's capacity to respond to extreme weather events; 2) investing in technologies for monitoring and combating environmental crimes; 3) promoting sustainable development policies; 4) integrating climate considerations

* Brazilian Army Officer. Graduated in Military Sciences at the Agulhas Negras Military Academy (2008). Postgraduate degree in Military Operations for Anti-Aircraft Defense and Coastal Defense; Master's degree in Military Sciences with an emphasis on the prevention and combating of terrorism at the Officer's Advanced Course.

into national security and defense planning; and 5) strengthening regional and international cooperation for the protection of the Amazon.

Implementing these measures is essential to guarantee national sovereignty, the security of the population, and the preservation of the Amazon's environmental heritage, in the context of growing climate challenges, which are increasingly taking on geopolitical dimensions.

Keywords: climate security; Amazon; national security; sustainable development; securitization.

1 THE DYNAMICS OF THE CLIMATE ISSUE IN THE AMAZON

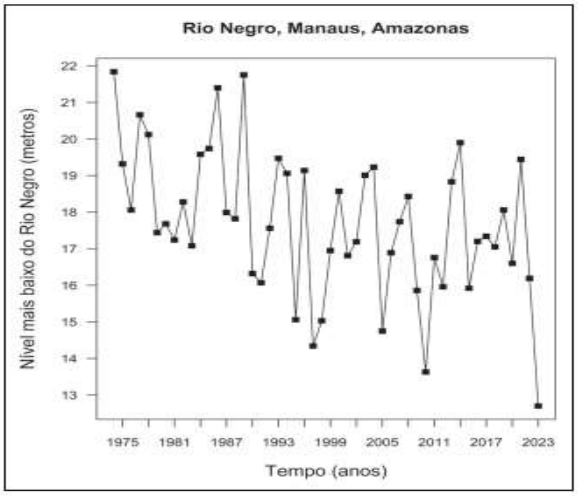
The Brazilian Amazon has faced increasing challenges related to climate change. The constant increase in average temperature, the occurrence of extreme weather events, the increase in deforestation and wildfires, and the pressure on existing natural resources in the region are obstacles that need to be prevented or combated.

Even though extreme weather events occur naturally, their frequency and intensity have increased significantly in recent times. In the Amazon, more frequent, intense, and prolonged episodes of drought have been observed, negatively impacting biodiversity, human health, and food security in the region (IPCC, 2023). Similarly, floods have been occurring more frequently, causing destruction in riverside communities and affecting local infrastructure (Marengo *et al.*, 2018).

The Amazon River basin presents conditions for human occupation that are susceptible to the consequences of extreme events generated or aggravated by climate change. In 2023, acute rainfall conditions at the beginning of the year caused exceptional floods in the states of Acre, Amazonas, Pará, and Maranhão, forcing 116,000 people to leave their homes (IDMC, 2024 *apud* Mendes and Spécie, 2024).

Also in 2023, starting in the middle of the year and continuing throughout the second half, the same region was plagued by drought, especially the state of Amazonas, which experienced the worst drought in a century. The Amazon River and its largest tributary, the Negro River, have reached their lowest recorded water levels, with devastating consequences for the fauna and vegetation (Figure 1). Riverside communities and indigenous groups were affected, and thousands of people migrated (INMET, 2023; NASA, 2023; FAPESP, 2023 *apud* Mendes and Spécie, 2024).

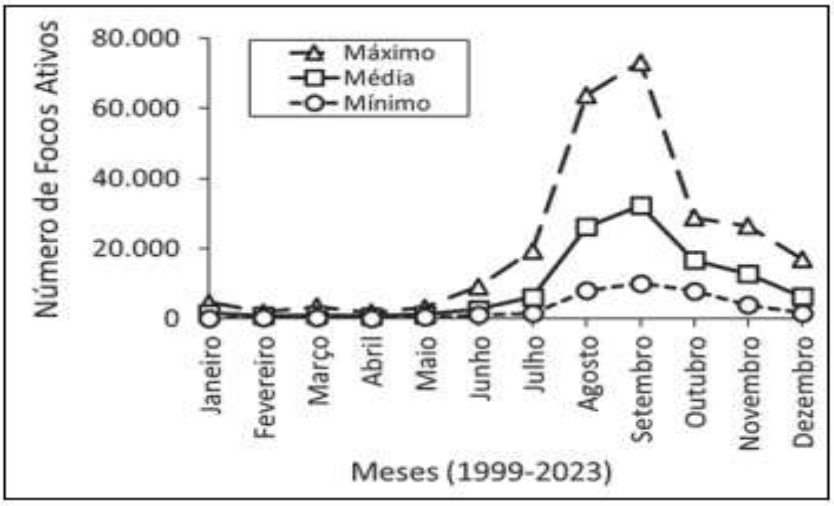
Figure 1 – Representation of the minimum (low) level of the Rio Negro (1974-2023)



Source: Brandão *et al.*, 2024.

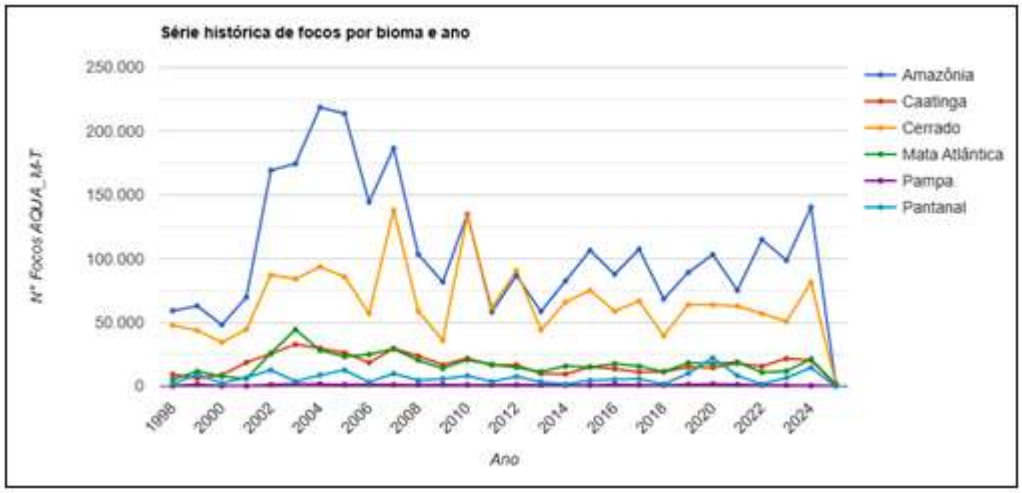
Benefiting from the aforementioned climatic conditions, which tend to worsen in the months of August, September, and October (Figure 2), anthropogenic actions of environmental degradation place more pressure on policies for the preservation of the Amazon. Based on data from the National Institute for Space Research (INPE), it appears that the Amazon biome is, in recent history, the Brazilian biome most subject to the occurrence of fire outbreaks (Figure 3).

Figure 2 – Comparison of maximum, average, and minimum values of active fire outbreaks (1999-2023), according to data from the AQUA_M-T satellite



Source: Brandão *et al*. (2024), based on data from INPE (2024).

Figure 3 – Comparison of current year data with maximum, average and minimum values between 1998 and April 16, 2025



Source: INPE, 2025.

According to Barlow and Peres (2008), the combination of droughts and forest fires increases tree mortality two to four times in the Amazon, which may be related to a severe modification in the physical structure of the forest, as well as a significant reduction in the number of native species. In this context, Table 1 shows how pressure on native vegetation has recently shown a growing trend.

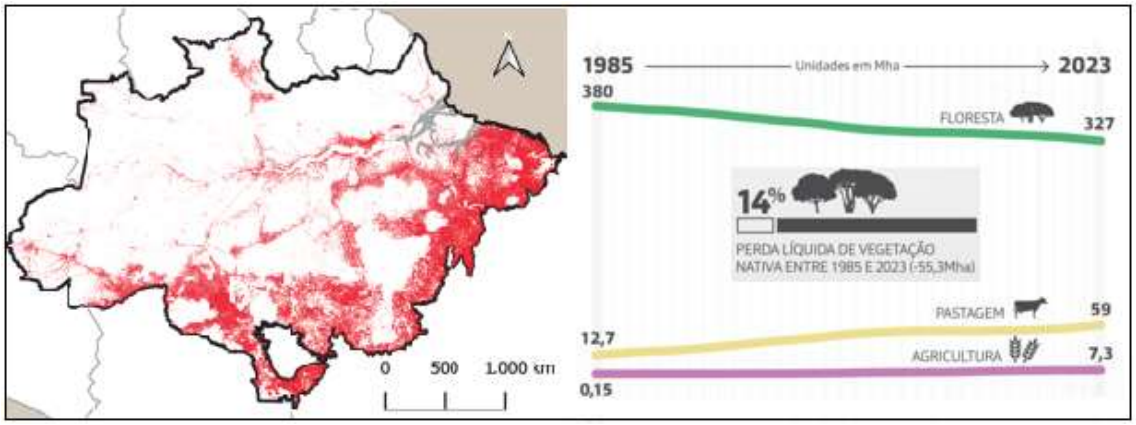
Table 1 – Percentage of fire outbreaks in native vegetation areas in the Amazon (2019-2024)

2019	2020	2021	2022	2023	2024	Average
11.8%	12.3%	9.1%	9.8%	12.2%	22.3%	13.6%

Source: The author, based on data from INPE (2025).

In this context, one of the conditions related to this phenomenon is the recent expansion of agribusiness frontiers in the country, which has been advancing on the fringes of the Legal Amazon, as stated by Pereira *et al.* (2020) (Figure 4).

Figure 4 – Accumulated deforestation in the Amazon (2022) and annual evolution of land use (1985-2023)



Source: The author, based on Brandão *et al.* (2024) and MapBiomas (2025).

Another very particular (and lucrative) constraint on the Amazon relates to the exploitation of mineral resources in its soil. Data from 2023 reveals that the Amazon concentrates 69.7% of the mining areas in the country, which includes industrial mining and artisanal mining, with the latter being more prevalent, totaling 306,918 hectares (Mapbiomas Brasil, 2025).

The issue of illegal mining in the Amazon region is particularly worrying. This is a small-scale mineral extraction activity, often carried out by individuals or small cooperatives, with low investment in technology and infrastructure. Thus, illegal mining is projected as an undertaking with a disproportionately large environmental impact, given its often predatory and unregulated practices (Boehm, 2024).

In the Amazon, illegal mining has a high rate of illegality and is frequently associated with local socio-environmental conflicts, such as illegal deforestation, pollution of water sources, child prostitution (Pinto and Vieira, 2018), and drug and arms trafficking. infantil (Pinto e Vieira, 2018) e o tráfico de drogas e armas. It is worth noting that, of the area mined in the Amazon, 10% is located within indigenous territories. The Kayapó, Munduruku, and Yanomami indigenous lands are the most occupied by illegal miners, concentrating 90% of the mined area located in lands of this category. (Boehm, 2024).

All of this has led recent research to focus on what has been called the “tipping point”. This refers to a condition in which there would be an irreversible reduction in biological diversity and forest carbon stocks, triggered by hydrological and energy changes resulting from the pace of global climate change and land use in the region. As a result, there would be a

process of *savannization* of the Amazon (Nobre *et al.*, 2023). Estimates indicate that, by 2050, between 10% and 47% of the Amazon rainforest could reach this critical point (Flores *et al.*, 2024).

Thus, the climate issue has an inseparable relationship with the Amazon. From this, socio-environmentally conflicting conditions are created, which may reveal serious challenges to national security.

2 THE EMERGENCY OF CLIMATE SECURITY AND ITS IMMPACTS ON THE AMAZON

The upcoming 2025 United Nations Climate Change Conference, COP30, in Belém, intensifies the relevance of the intersection between climate change and the challenges facing the Amazon on the global environmental agenda.

Previous editions of COP have not shied away from debating the topic and, therefore, serve as a prelude to what will be discussed in the 2025 edition. COP26, for example, held in Glasgow in 2021, brought to the forefront discussions about the importance of the Amazon for global climate security. In it, among the various debates, a Scientific Panel for the Amazon was established, which released a report warning that the forest was close to a critical point in more than 60% of its basin (Modelli, 2021).

At COP27 in 2022, held in Sharm El Sheikh, Egypt, President Luiz Inácio Lula da Silva, in his speech, emphasized the fundamental role of the Amazon for humanity, saying that: "There is no climate security without a protected Amazon," in a clear attempt to draw the world's attention to the need to create financial mechanisms to remedy losses and damages caused to the Amazon due to climate change (Lima, 2022).

In this context, a better understanding of what two very useful terms for the discussion at hand can represent is needed: climate security and environmental securitization.

According to the International Organization for Migration (2025), a United Nations agency working in the field of migration and climate security

> refers to the direct and indirect impacts of the climate crisis on peace and security, where climate change acts as a threat multiplier, exacerbating underlying vulnerabilities and compounding existing grievances. The consequences of climate change affect all areas of human security (economic, food, health, environmental, personal, community and political) and undermine conflict prevention, sustaining peace and sustainable development efforts with a disproportionate impact on communities with existing vulnerabilities [...].

In turn, the Pacific Northwest National Laboratory (2025), a laboratory affiliated with the United States Department of Energy, presents a broader definition, but one that follows a similar logic, stating that:

> Climate security represents the physical, economic, or societal impacts associated with climate change that substantially alter political stability, human security, or national security infrastructure The escalating climate crisis generates geopolitical and socioeconomic stressors, such as population displacement, terrorism, economic stagnation, infrastructure impacts, and social unrest.

Therefore, the Brazilian Amazon, being the largest tropical rainforest biome in the world, is recognized as crucial to global climate security. According to Nobre *et al.* (2023),

> The Amazon rainforest is essential for regulating the global climate, acting as a carbon sink and contributing to the hydrological cycle. Degradation and deforestation of the Amazon could have devastating consequences for the planet's climate security.

This opens the door for the construction of narratives that reinforce positions of environmental securitization. Environmental securitization is a theoretical concept from the field of strategic studies. It develops from the dialogue between the currents of Structural Realism and Wendtian Constructivism and refers to the process by which environmental issues are elevated to the level of a threat to national or international security, thus justifying the use of extraordinary measures for their resolution (Buzan *et al.*, 1998).

Securitization, according to Buzan *et al.* (1998, pp. 23-24), occurs "(...) when an issue is presented as an existential threat, requiring emergency measures and justifying actions outside the normal bounds of political procedures."

This type of strategic conception became very common after the Cold War, driven by the success of the Copenhagen School, which led many international agendas to address issues that were not previously viewed from a security perspective. Issues such as the economy, human rights, and the environment have become security matters and have come to be treated as a priority. In addition, new reference objects (i.e., things that are under threat) have gradually been perceived as eligible for protection by the international community (Mendes *et al.*, 2020).

Therefore, the securitization of the Amazon can lead to an increase in regional and international cooperation mechanisms, as in the cases of the Amazon Cooperation Treaty Organization (ACTO) and the Amazon Fund, but it can also result in tensions between States, especially if strategic resources such as water and energy are in dispute.

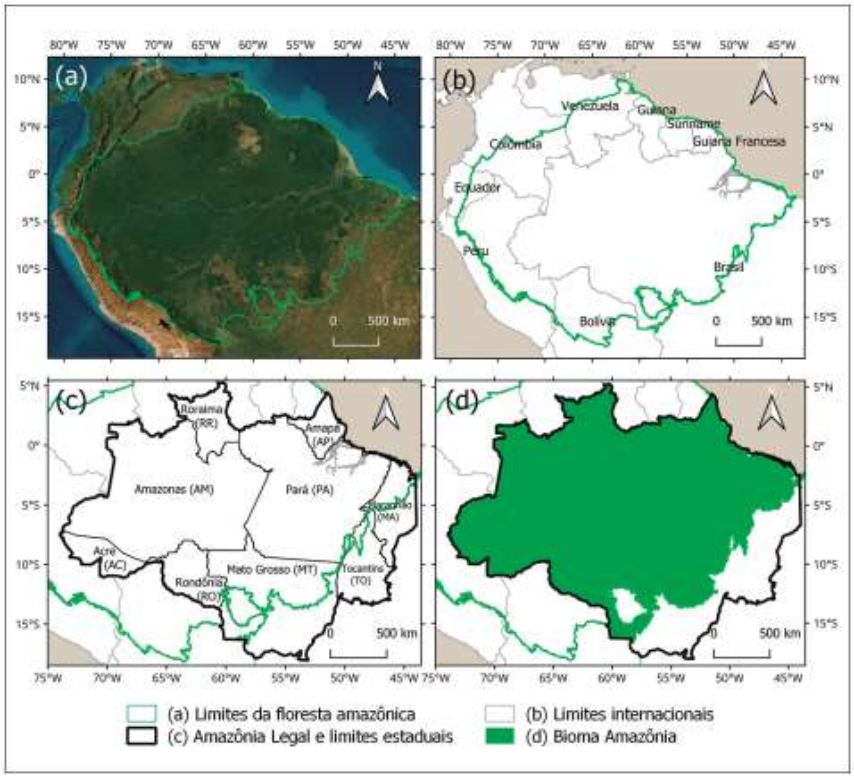
3 IMPLICATIONS OF CLIMATE CHANGE IN THE AMAZON FOR BRAZIL'S SECURITY AND DEFENSE

From what has been presented so far, it can be inferred that, in contemporary times, climate issues will always have an impact on matters related to National Security. When such issues are focused on the Brazilian Amazon, their impacts take on superlative dimensions, given the geostrategic nature of this region for the country and its relevance to global climate regulation, granting it a double value, from both a domestic and international perspective (Mafra, 2006).

The importance of the Amazon for Brazilian national security is highlighted by Professor Therezinha de Castro, who, in her extensive work on the subject, emphasized the need to integrate the region into the national whole to guarantee the country's sovereignty and its sustainable development. Therefore, within the idea of "integrating so as not to surrender," that renowned geopolitical theorist advocated for an integrated approach that combined economic development, environmental protection, and territorial defense, in order to guarantee the security and prosperity of the Amazon (Mafra, 2006).

The Brazilian Amazon, in addition to covering approximately 60% of Brazilian territory, shares 11,000 km of borders with seven countries: Venezuela, Guyana, Suriname, French Guiana (a French overseas territory), Colombia, Peru, and Bolivia. Furthermore, it patents for itself full control of the mouth of the Amazon, the gateway to the exploitation of much of the biome's potential, which includes the largest reserves of surface and groundwater in the world: the Amazon basin and the Great Amazon Aquifer System (Figure 5) (Abreu *et al.*, 2013 *apud* Peixoto Júnior, 2020).

Figure 5 – Geospatial delimitation of the Amazon area



Source: Brandão *et al*. (2024), based on data from INPE (2023); QGIS (2023).

In this context, the low human occupation rates in the Amazon (Viana, 2021) are compounded by the mobility difficulties in that area, which are exacerbated by dissociative forest assets and by sparse and poorly structured road networks (Virga *et al.*, 2021). This combination of factors results in regional socioeconomic asymmetries (Viana, 2021), which then point to the need for a geopolitical guideline structured around the need to integrate the region into the national whole, which involves initiatives by the public authorities, such as the technical development of indigenous populations, in order to promote social well-being, accompanied by the sustainable exploitation of the natural resources richly offered by the Amazon (Mafra, 2006).

For all these reasons, perhaps no other part of Brazil can translate the validity of the trinomial Security, Development and Defense as well as the Amazon. In this region, the parts of this trinomial assume interdependent concepts, without which one cannot develop without the other.

In this context, Security is a duty of the State and can be understood as an indispensable "factor of production" for Development, guaranteeing it the necessary stability. Development, in turn, ensures that the State has the resources necessary to promote its own Security, being

able to protect its people and institutions against all sorts of threats (Arruda, 1989). From this mutually supported interaction, the result is the strengthening of the country's Defense capacity, through its ability to mobilize resources for the Nation's struggle and resistance in favor of guaranteeing its sovereignty (Couto and Silva, 1967 *apud* Mansan, 2022).

Therefore, it can be inferred that the development of sustainable production chains in the Amazon can generate employment and income for local communities, reduce pressure on natural resources, and strengthen the State's presence in the region, developing a healthy socio-bioeconomy that benefits from the entire ecosystem through an interdisciplinary economic approach. This may include forest restoration and conservation; agroforestry system management; industrial processing of native products; sustainable extraction of mineral resources; fisheries management; ecotourism; and biotechnology development (Brandão *et al.*, 2024).

National Security, then, under the understanding of the trinomial Security, Development, Defense already presented, would translate into the relative guarantee that the State provides to the Nation, using its resources, in order to achieve and preserve its Fundamental Objectives: sovereignty, democracy, social peace, national integration, progress and the integrity of the national patrimony (Escola Superior de Guerra, 2024).

Therefore, based on the understanding of National Security and through the conjunction of the influences of the climate agenda on the Amazon, the implications of the topic under study for Security and Defense issues can be objectively determined, namely:

a. Regional instability and population displacements: climate migrations in the Amazon can generate social tensions and conflicts over resources, both local and transnational, requiring a response from the State to guarantee the security and stability of affected areas.

b. Threat to strategic infrastructure: following the occurrence of extreme events, the perceived risk to regional infrastructure increases. This includes the operation of roads, ports, and other essential logistics or service facilities located in the Amazon.

c. Intensification of illegal activities of a local and cross-border nature: environmental degradation and biodiversity loss, exacerbated by climate change, can increase pressure on the Amazon's natural resources, encouraging illegal activities such as biopiracy and illegal mining. Such activities are facilitated by border and local landlocked communities.

d. Need for adaptation, training, and equipping of the State's defense, security, and oversight apparatus for future (and present) challenges: security forces and the Armed Forces need to be able to work in the unique environment of the Amazon rainforest, as it is and as it

may become. This includes training personnel to operate in extreme weather conditions and the use of advanced technologies.

e. Need for regional and international cooperation: the protection of the Amazon must be a shared responsibility, since the Amazonian biome transcends national borders and its scientific and environmental value is recognized by the international community.

4 RECOMMENDATIONS

The climate agenda poses internal and external challenges to the Amazon. These challenges are multifaceted and complex, requiring the mobilization of all expressions of National Power (Political, Economic, Psychosocial, Military, and Scientific-Technological).

In this sense, a national debate regarding broader strategic directions that could safeguard national assets in that region becomes imperative. There is a clear vicious cycle in which internal factors, such as demographic voids and the inadequacy of the state control apparatus, combine in an entropy of forces that limit the sustainable development of the Brazilian Amazon, giving substance and supposed legitimacy to external interferences, which are often accompanied by Balkanizing[1] intentions and theses of limited sovereignty over an area of global relevance.

Therefore, it is necessary, and urgently, to develop a multidisciplinary political-strategic approach that takes into account the following recommendations:

.The State needs to be prepared to deal with the increase in migratory flows and the protection of vulnerable populations, coordinating humanitarian assistance and order maintenance actions, with flexibility and adaptability, in order to mitigate the formation of regional instability zones.

.The State must invest in resilient infrastructure and contingency plans that guarantee the operability of essential services to the local population, the maintenance of road communication lines and the capacity to respond to emergencies, thus preserving its strategic structures.

[1] The term refers to a process of **territorial and political fragmentation** to which a geographic area can be subjected. In this context, the area is divided into smaller entities, often hostile to each other or susceptible to external influences, resulting in instability and loss of central control, as occurred with the former Yugoslavia in the Balkans. In the case of the Amazon, it is suggested that the same phenomenon could occur if Brazilian indigenous policy, particularly when dealing with the demarcation of indigenous lands, disregards geopolitical and strategic analyses crucial to the country's security and defense.

.The Armed Forces and security, inspection, and control agencies need to intensify monitoring and surveillance at the borders and in critical areas of the Amazon, in order to prevent and combat the occurrence of illegal activities that weaken National Security.

.The State must invest in specialized training and new technologies, including defense systems geared towards anti-access and area denial (A2/AD), telecommunications systems, remote sensing, and climate modeling, in order to deter threats and strengthen its response capacity.

.The State must promote cooperation with other countries, in order to facilitate the sharing of information, coordinate preventive and repressive actions of a combined nature, and seek resources or partnerships that provide opportunities for the sustainable development of the region.

REFERENCES

ARRUDA, A. Doutrina da ESG: principais alterações ocorridas nas últimas quatro décadas. **Revista da Escola Superior de Guerra**, ano V, n. 12, p.13-22, 1989. Available at: https://doi.org/10.47240/revistadaesg.v0i12.124. Accessed on: 14 April 2025.

BARLOW, J.; PERES, C. A. Fire-mediated dieback and compositional cascade in an Amazonian forest. **Philosophical Transactions of the Royal Society B**, v. 363, n. 1498, p. 1787-94, 2008. Available at: https://doi.org/10.1098/rstb.2007.0013. Accessed on: 3 April 2025.

BOEHM, C. Na Amazônia, 77% do garimpo fica a menos de 500m de cursos d'água. **Agência Brasil**, 19 abr. 2024. Available at: https://agenciabrasil.ebc.com.br/geral/noticia/2024-04/na-amazonia-77-do-garimpo-esta-menos-de-500-m-de-cursos-dagua. Accessed on: 08 April 2025.

BRANDÃO, D.O.; ARIEIRA, J.; NOBRE, C. A. Impactos das mudanças climáticas na sociobioeconomia da Amazônia. **Estudos Avançados**, v. 38, n. 112, p. 249-70, 2024. Available at: https://www.scielo.br/j/ea/a/cmRbzPY8RD7yGSFFpGkBQwF/?format=pdf&lang=pt. Accessed on: 13 April 2025.

BUZAN, B.; WÆVER, O.; DE WILDE, J. **Security:** A New Framework for Analysis. Boulder, CO: Lynne Rienner Publishers, 1998.

ESCOLA SUPERIOR DE GUERRA (ESG). **Fundamentos do Poder Nacional**. Rio de Janeiro: Ed. ESG, 2024.

FLORES, B. M.; MONTOYA, E.; SAKSCHEWSKI, B. *et al*. Critical transitions in the Amazon forest system. **Nature**, v. 626, p. 555-64, 2024. Available at: https://doi.org/10.1038/s41586-023-06970-0. Accessed on: 10 April 2025.

INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS. **INPE**, 2025. Queimadas. Available at: https://terrabrasilis.dpi.inpe.br/queimadas/situacao-atual/estatisticas/estatisticas_estados/>. Accessed on: 17 April 2025.

LIMA, L. "Não há segurança climática sem Amazônia protegida", diz Lula na COP27. **Amazônia Real**, 16 nov. 2022. Available at: https://amazoniareal.com.br/lula-na-cop27/. Accessed on: 2 April 2025.

MAFRA, R. M. de O. **Geopolítica**: Introdução ao Estudo. 1a edição. São Paulo: Sicurezza, 2006.

MANSAN, J. V. O binômio "Segurança e Desenvolvimento": propaganda, controle social e educação superior durante a ditadura militar no Brasil (1964-1988). **Cadernos de História da Educação**, v. 21, n. 144, p.1-25, 2022. Available at: https://doi.org/10.14393/che-v21-2022-144. Accessed on: 10 April 2025.

MAPBIOMAS BRASIL. **MapBiomas**, 2025. Infográficos. Available at: https://brasil.mapbiomas.org/infograficos/. Accessed on: 30 Mar. 2025.

MARENGO, J. A.; SOUZA Jr, C. M.; THONICKE; K. *et al*. Changes in Climate and Land Over the Amazon Region: Current and Future Variability and Trends. **Frontiers in Earth Science**, v. 6:228, p. 1-21, dez. 2018. Available at: https://doi.org/10.3389/feart.2018.00228. Accessed on: 20 July 2025.

MENDES, J. S. R.; SPÉCIE, P. Migrações climáticas na Amazônia brasileira: a emergência em curso e os desafios das organizações internacionais na região. **Cadernos do CEAS**: **Revista Crítica de Humanidades**. Salvador/Recife, v. 49, n. 261, p. 109-131, jan./abr. 2024. Available at: https://doi.org/10.25247/2447-861X.2024.n261.p109-131. Accessed on: 3 April 2025.

MENDES, C.; DOS SANTOS, L.; DE SOUZA, M. Climate change, vulnerability and securitization. **Revista Brasileira de Política Internacional**, v. 63, n. 1, p. 1-22, 2020. Available at: https://doi.org/10.1590/0034-7329202000114. Accessed on: 10 April 2025.

MODELLI, L. COP26: Quase 70% dos territórios indígenas e áreas protegidas no bioma Amazônia estão ameaçados, diz relatório. **Portal G1**, 12 nov. 2021. Available at: https://g1.globo.com/meio-ambiente/cop-26/noticia/2021/11/12/cop26-quase-70percent-dos-territorios-indigenas-e-das-areas-protegidas-no-bioma-amazonia-estao-ameacadas-diz-relatorio.ghtml. Accessed on: 30 Mar. 2025.

NOBRE, C.; ARIEIRA, J.; BRANDÃO, D. O. The Amazon is near a tipping point: We need urgent nature-based solutions. **World Economic Forum**, 20 dez. 2023. Available at: https://www.weforum.org/stories/2023/12/the-amazon-is-near-a-tipping-point-the-urgent-need-for-nature-based-solutions-wef24/#:~:text=This%20article%20is%20part%20of,in%20the%20dry%20season%20month. Accessed on: 20 July 2025.

INTERNATIONAL ORGANIZATION FOR MIGRATION. **OIM**, 2025. Available at: https://environmentalmigration.iom.int/climate-and-security. Accessed on: 14 April 2025.

PACIFIC NORTHWEST NATIONAL LABORATORY. **PNNL**, 2025. Climate Security (Anticipating climate change impacts on national security). Available at: https://www.pnnl.gov/climate-security#:~:text=Climate%20security%20represents%20the%20physical,security%2C%20or%20national%20security%20infrastructure. Accessed on: 14 April 2025.

PAINEL INTERGOVERNAMENTAL SOBRE MUDANÇA DO CLIMA (**IPCC**). Relatório Síntese do Sexto Relatório de Avaliação, 2023. Available at: https://www.ipcc.ch/report/sixth-assessment-report-cycle/. Accessed on: 16 April 2025.

PEIXOTO JÚNIOR, H. L. C. **A Geopolítica da Amazônia: os recursos naturais estratégicos e a presença do Exército Brasileiro.** 2020. 56 f. Trabalho de Conclusão de Curso (Especialização em Ciências Militares) –Escola de Comando e Estado-Maior do Exército, Rio de Janeiro, 2020.

PEREIRA, E. J. A. L.; RIBEIRO, L. C. S.; FREITAS, L. F. S. *et al*. Brazilian policy and agrobusiness damage the Amazon rainforest. **Land Use Policy**, v. 92, Mar. 2020. Available at: https://doi.org/10.1016/j.landusepol.2020.104491. Accessed on: 10 April 2025.

PINTO, I.; VIEIRA, A. Exploração sexual juvenil nas águas amazônicas e suas interfaces com a escola. **Revista Amazônida**, v.3, n. 2, p. 117-138, 2018. Available at: https://doi.org/10.29280/rappge.v3i2.4508. Accessed on: 20 July 2025.

VIANA, V. Abordagem sistêmica para o desenvolvimento sustentável da Amazônia profunda. **Revista Tempo do Mundo (RTM)**, n. 27, p. 71-99, dez. 2021. Available at: https://doi.org/10.38116/rtm27. Accessed on: 11 April 2025.

VIRGA, T.; MIRANDA, H.; DE MARCHI, B. Integração física na Amazônia Sul-Americana: a inclusão das órbitas de circulação intrarregionais na agenda pública. **Revista Tempo do Mundo (RTM), n.** 27, p. 215-246, dez. 2021. Available at: https://doi.org/10.38116/rtm27. Accessed on: 11 April 2025.