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CONTENTS


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Editorial

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In this issue of the Meira Mattos collection we have a set of articles focused on issues focused on different processes in military organizations. Starting with education in the articles "Research on sustainable practices in military organizations - a systematic review of the literature" and "The history of military education in perspective - training of officers of the Agulhas Negras Military Academy (1989-2018)". Two other articles are focused on internal management "The customization of technological readiness assessment processes based on the TRL scale - development of a methodology for the Brazilian Army" and "Research on sustainable practices in military organizations - a systematic review of the literature".

Other articles deal with the important issues for the debates around national and international security and defense. Looking at border issues, and dialoguing with the dossier launched in January 2022 (CMM. v. 16, n. 55), we have the articles "Health Security on the Brazil-Venezuela border - vulnerabilities and opportunities" and "Territorial walls and migration controls in Italy and Greece during the Syrian humanitarian crisis (2015-2018)".

Finally, the last two texts deal with important topics for the country, which are the Cyber issue and the reform of the UN Security Council. These are the texts: "Cyberspace, Logistics and National Security Threats, Not Necessarily in that Order" and "For a seat at the high table! Economic expression of national power as a factor of influence for the reform of the United Nations Security Council".

Reference

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Research on sustainable practices in military organizations: a systematic literature review

Investigación sobre prácticas sostenibles en organizaciones militares: una revisión sistemática de la literatura

Abstract: The article aims to systematize Military Organizations as previous evidence of sustainable management practices. A Systematic Literature Review was carried out using the Web of Science and Scopus databases. We analyzed the relevant publications regarding the barracks in the period of 11 years on sustainable management. The methodology was based on Prisma, where a logic of information relevant to the research was carried out. The evaluation of the articles was carried out from their articles, and their measurement, separating them in quality in Excel, so that there is no duplicity duplicity. Initiatives proposed in the development of systems to improve management are identified in the research, in which the following stand out: Projects for constructions; Water Resources Management; and Decision-making tools. Finally, the results indicate that there are initiatives to improve sustainable management in military units, however, they are still scarce.

Keywords: Management; Armed Forces; Sustainability.

Resumen: El artículo tiene como objetivo sistematizar las evidencias previas de prácticas de gestión sostenible en Organizaciones Militares. Se realizó una Revisión Sistemática de la Literatura utilizando las bases de datos Web of Science y Scopus. Analizamos publicaciones relevantes sobre la gestión sostenible en los cuarteles durante un período de 11 años. La metodología se basó en la estandarización Prisma, donde se realizó una secuencia lógica de información relevante para la investigación. La evaluación de la calidad se realizó a partir de los artículos, y su respectiva medición, separándolos en columnas en Excel, para que no existiera duplicidad. Identificadas en la búsqueda iniciativas realizadas en los cuarteles para desarrollar sistemas sostenibles de mejora de la gestión, en las que se destacan: Proyectos de construcciones; Gestión de Recursos Hídricos; y Herramientas para la toma de decisiones. Finalmente, los resultados indican que existen iniciativas para mejorar la gestión sostenible en las unidades militares, sin embargo, aún son escasas.

Palabras clave: Gestión; Fuerzas Armadas; Sostenibilidad.

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1 Introduction

Sustainable development has been gaining strength within public institutions, where there is a constant concern to maintain environmental order and balance. "Sustainability is defined by the possibility of ensuring systemic and continuous balance, which provides conditions for the continuity of life on the planet" (MORAIS; MARTINS; SANTOS, 2020, p. 4). In 2015, the United Nations (UN), together with representatives of 193 national states, drafted the Sustainable Development Goals (SDGs) as part of a new agenda that proposed the Millennium Development Goals (MDGs) (2030 Agenda). These goals represent a global plan of action to eliminate extreme poverty and hunger, deliver lifelong quality education for all, protect the planet, and promote peaceful and inclusive societies by 2030 (UNICEF, 2021).

"The 2030 Global Agenda deals with a set of programs, actions and guidelines that will guide the work of the United Nations and its member countries towards sustainable development" (NAHAS; HELLER, 2017, p. 3). According to Nunes *et al.* (2012), the Armed Forces have sought to improve their relations with the environment, as they have legal support and technical preparation to be employed in environmental actions. With this, it is possible to verify that there is an alignment and dedication of the force with environmental projects.

The Brazilian Armed Forces play an important role in guaranteeing national sovereignty, in terms of fulfilling missions related to guaranteeing the Law and Order of the Democratic State (BRASIL, 1999). Actions focused on sustainability have become an important means of strengthening the image of the Armed Forces before the Brazilian society (BOAVENTURA; GOMES, 2018). This highlights the force's commitment to focus on the future. Several discussions about sustainability have become common in the agendas of the barracks, regarding the duration of the force in external actions, always remaining operational in the missions (BRASIL, 2020). According to Almeida, Scatena and Luz (2017), it is necessary to transpose the theory based on the discussions and apply them in the environment with commitment, given that sustainable principles in public management require a change in attitudes and practices.

The Brazilian Army (EB) in recent years has been working based on some of the guidelines of the Directorate of Real Estate Asset and Environment (DPIMA), with regard to sustainability practices within the military units, among them: normative instructions, environmental lecture, training of the military to act, partnerships with higher institutions to exchange experiences, waste management, etc. It is interesting to look at the guidelines because, according to Nunes *et al.* (2012), the standards specifically define the goals and other devices that aim to eliminate or minimize as much as possible the negative impact on the environment. In other words, following what is prescribed can ensure, through daily actions, the promotion of quality of life for the military.

The commitment to follow the guidelines within the military units with the aim of internal improvement, in addition to obtaining beneficial results for the unit, may also

receive other benefits, namely, "the olive green seal of sustainability" certification granted by the DPIMA, which attests to the MOs a highly relevant environmental qualification and compliance with sustainable goals above 90% (EXÉRCITO, 2020).

Some published research, located in the databases and mentioned in this work, highlight the importance of sustainable management practices applied in military units. With this, the importance of rescuing these studies arises, raising the question of how does military organizations have incorporated sustainability practices into their processes? The main objective of the research is to systematize previous evidence of sustainable management practices in Military Organizations. For this, this systematic literature review article was developed to verify studies focused on the sustainable area within military organizations. In short, this research is necessary to precisely align a systematized vision to what has already been published and carried out in military units, thus providing a greater reflection to improve the processes

2 Methods

The research is based on a Systematic Literature Review, carried out through the Web of Science and Scopus databases, which have a good adherence of a scientific character to international and national researchers, in addition to having a series of journals of global impact. The standardization for the research was the Prisma, where a logical sequence of the information pertinent to the study was carried out.

The quality assessment in the studies was carried out exhaustively from the Web of Science and Scopus databases, relevant databases for research and with international scope, which was essential to improve the quality of this work.

The time period was introduced in the cited databases to extract relevant numbers of works published in the last eleven years (2010-2021). This period was chosen as a criterion as it would better delimit the time space for publication of works, so that the works published in 2021 would be important to equate with the previous ones. Soon after, the use of keywords at that moment was essential for the research, each word was used individually, and those inserted were: "sustainability and army"; "sustainability and aeronautics"; "sustainability and marine" and "sustainability and "armed forces". A total of 706 works were found.

Then, the criteria for inclusion and exclusion of articles were used. The filters for this section were initially performed based on the words described, in order to locate the maximum number of works related to sustainability within the platform. Subsequently, all files were downloaded in Excel format, which made it easier to search for duplicate works and, after that, to delete them.

Soon after, the next criterion was to read the titles of the works separately; with this, it was verified that a large part of the titles did not match with the profile of the research, being focused on other aspects outside the standard of adherence of the research. With this, 58 papers (duplicates) and 616 (titles of papers that did not correspond to the expectations of the research) were removed. Then, it was necessary to read the summaries of the 32 remaining works, in order to verify the relationship with the development of sustainable practices within military

organizations, after reading, it was found that only 11 of these met the objective of the research, the others were excluded, as they did not meet the objective proposed by the research.

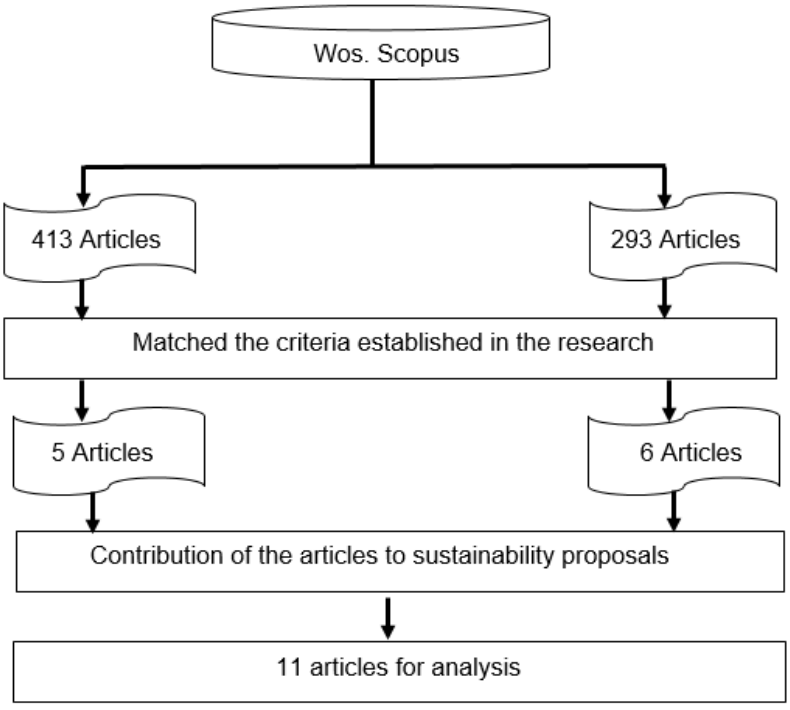
The analysis of the quality of the selected articles was carried out from a view conditioned to the common aspects evidenced in each research, namely: objectives and relevant and positive results, in addition to their publications being in management/environmental journals, and Journal of high concept in the academic community. With this, the selected articles were read, then a summary of each one was prepared and organized in tables for a better visualization in order to systematize the necessary information about the theme proposed in the research.

The research is classified as exploratory bibliographic, and its approach was considered qualitative. "Qualitative analysis depends on many factors, such as the nature of the data collected, the research instruments and the theoretical assumptions that guided the investigation" (GIL, 2002, p. 133).

The analysis in the database was of paramount importance for the construction of this research, as well as the collection of information for the purpose of insertion in the platform, the reading carried out from the extraction of documents from the base will be fundamental for methodological discussions involved in the work.

3 Results

Figure 1 – Results obtained in the Wos and Scopus databases



Fonte: O autor (2021).

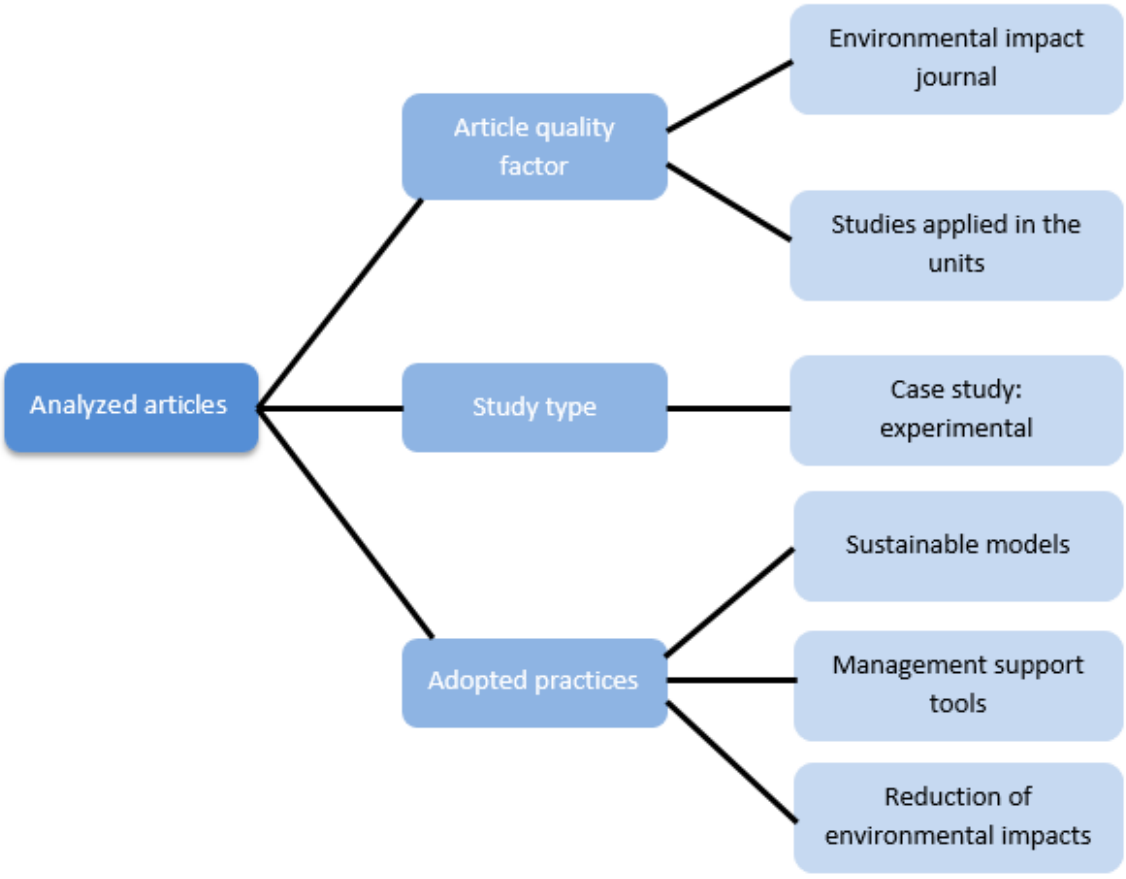
Table 1 – Management Proposals Prepared by the Armed Forces

Author	Location/ Organization	Keywords	Main management proposals for sustainability
Kukjoo Kim and Youngjun Park	South Korea	Army	• Good construction practices in the army; • Procurement of sustainable materials for construction projects; • Planning for cost reduction and CO2 reduction.
Jun Wang	United States	Army	• Cost analysis for sustainability; • Analysis of internal logistics structures; • Assessment through tools for decision making.
A Filinkov, M Richmond, R Nicholson, M Alshansky and J Stewien	Australia	Army	• Creation of management models focused on sustainability; • Analysis of structural environmental impacts; • Creation of internal sustainable policies.
Nathaniel D. Bastian	United States	Army	• Cost estimation for internal environmental quality; • Assessment of projects for sustainable certification of buildings; • Decision making based on support tools.
Christos Makropoulos, Ifigeneia Koutiva, Panagiotis Kossieris and Evangelos Rozos	Greece	Army	• Use of support tools to support management; • Implementation of integrated solutions for water management; • Proposals based on intelligent systems to comply with strict environmental standards.
Colin Chadderton, Christy M. Foran, Giselle Rodriguez, Dominique Gilbert, Steven D. Cosper and Igor Linkov	United States	Army	• Application of technological resources for water management; • Control of costs and materials used in composting; • Assessment of structural scenarios based on the use of support tools for waste control.

Author	Location/ Organization	Keywords	Main management proposals for sustainability
Stephanie M. Rice and Elizabeth J. Keysar	United States	Army	• Initial planning for implementation of sustainable projects; • Effective management in controlling cost savings; • Definition of the scope of renewable energy projects for environmental control purposes.
Jessica S. Gonzales	United States	Army	• Preparation of decision matrix to assess the best systems for water management; • Analysis of studies for the use of viable technology for water treatment; • Use of a beneficial treatment system for use in self-sustaining camps.
James C. Dalton, Stephen R. Arnold and Kathleen D. White	United States	Army	• Management of water resources in the force; • Study of matrices for the purpose of climate adaptations for internal knowledge regarding recurring missions; • Infrastructure resilience through the implementation of sustainable measures.
Donalda Karnauskaite˙, Gerald Schernewski , Josianne G. Støttrup and Marija Kataržyte	Lithuania	Marine	• Tools for indicator-based sustainability assessment; • Integrated systems approach for sustainability; • Decision support tool.
Kukjoo Kim, Kyung-Ryeung Min and Young-Jun Park	South Korea	Armed Forces	• Internal analysis that ensures economic efficiency to manage the control of the facilities; • Assessment of prices for purchases of materials that minimize environmental impacts; • Reduction of CO2 from the use of sustainable materials.

Fuente: Adaptado por el autor de *Web Of Science/Scopus* (2010-2021).

Figura 2 – Categorías temáticas del artículo



Fuente: El autor (2021).

4 Discussion

The theoretical perspectives that support the work were adopted through criteria described from the keywords, and thus, with the objective of identifying sustainable management practices in military organizations through the point of view and methodology of the analyzed articles. In order to organize and thus discuss the presentation of the data, Table 1 presents the information collected from the research in its entirety.

It was performed the reading of 10 articles related to the Army, and 1 related to the Navy, found in the Web of Science and Scopus database, where it was possible to collect information on the research theme that is inserted in the basis of the problem: "How have military organizations incorporated sustainability practices into their processes?"

In order to analyze the performance of the Armed Forces in the face of the sustainable universe, the work and contribution of each one to its unit were analyzed. At this stage, it was identified that some military units have proposed sustainable initiatives of great value for the protection of their barracks, so that the materials and resources used can minimize environmental impacts, thus performing a conscious sustainable management that will directly affect the image of the unit, permeating the commitment to the present and future generation. Table 1 presents this information clearly.

As shown in Table 1, it is possible to observe that studies related to sustainability are part of military initiatives to develop sustainable systems for the protection of facilities, preservation of the internal system, qualification of the military and use of technology to improve their processes. Among the different themes studied, it was possible to identify the main ones, namely: Projects for military constructions; Water Management; Water Resources Management; and Support tools for decision making. The articles were analyzed, and the main conclusions are presented below.

In the study by Kim and Park (2020), the initiative to propose viable guidelines to reinforce the protection of military installations was verified, replacing materials, previously used in local reforms, with materials that have more adhesion, economy and do not damage the environment, thereby reducing CO2 in the environment. With this, it is interesting to note that the study for this purpose assumes a series of internal and external analyses, and with the mission of improvements, aiming to ensure good construction practices within army facilities.

In the study by Jun Wang (2019), the research is developed in order to test some software to support decision making, so that it could organize training and verify resilience among the military, and then test a technological system for assessing the military structure as a whole. It is important to point out that the decision-making process is of paramount importance in organizations, because there are numerous ways for the decision-maker to reach decision-making, there is a complex of inquiries carried out in different scenarios, which, in a coherent way, the decision-maker, focusing on if at the current time, execute their line of action.

In the study by Filinkov *et al.* (2017), the creation of a sustainable planning tool was verified, so that its use brought significant results to the Australian military unit, allowing to test characteristics in the face of the personnel recruitment process, resources used, force costs, in addition to to provide insights into the operation's weak points and areas with deficiency. With this, the Australian force ensures conditions to carry out a good selection within the established standards and strengthens the link of sustainable management in the face of force conditioning. The unit's vision of working with tools and systems makes management viable and makes them visionary, the future is uncertain, however, with the proper use of technologies that benefit the environment, making it different from other barracks.

In Bastian's (2011) study, it is possible to see that he addresses aspects of military engineering management when making specific decisions based on the support tool, in order to institutionalize healthy daily practices in buildings, so that they could reduce environmental impacts, promoting technological innovation in their assignments. It was verified in the results that the use of the management tool is of great value, because the decisions for the acquisition of material were taken with caution, regarding the expenses and use of construction materials, as well as the use of sustainable models that ensured the most economical route of the entire process, thus supporting the relevance of working with optimism and sustainable goals.

The study by Makropoulos, Kossiens and Rozos (2019) demonstrates the concern of the military unit regarding the management of water resources, which also chose to use a tool and support for strategic planning to analyze water in fields that had European military facilities. The tool made it possible to quickly identify strengths and weaknesses with regard to water management at the field level, identifying opportunities for improvement and finding solutions to solve problems, thus raising awareness among the military to use viable technologies to reduce local problems. An interesting factor that needs to be discussed is water management, it is known that water as an essential resource for the planet needs to be managed with balance, for that, the use of the support tool becomes essential for the moment, as it will guarantee the well-being of the military in the surroundings of the camps and will contribute to the reuse of water, and other aspects that allow its reuse.

The study by Chadderton *et al.* (2017) is based on the importance of waste management in US military installations, with regard to the use of the support tool that incorporates multi-criteria decision analysis. The analysis, carried out in three different facilities, was limited to the application of technological resources, focusing on waste management from aspects related to energy control, various costs, etc. The tool supported the military based on the choice of technologies for use by the military, the study shows that it is possible to establish waste reduction measures with an effective management based on the use of economic technologies for sustainable development in the military facility. it is known that the multicriteria analysis permeates a method that consists in the elaboration of panels for the purpose of building a decision model, which support the decision-maker's choices, an excellent method that the unit used which, in turn, brought perspectives for improvements for use.

The study by Rice, Keysar (2017), addresses studies of the National Environmental Policy Law in order to bring improvements to the adequacy of projects focused on renewable energies. The research brought as results points that need to be analyzed in order to obtain a good management, such as: coordination that is adequate for the beginning of the project, inherent environmental conditions, effective management for cost savings, etc. The study of alternatives based on the analysis of the Law is effective, as it has brought possibilities and actions that facilitate the management of the entire initial process of the unit, focusing on sustainable criteria, in order to have a positive impact on the environmental health of the establishment.

In the study by Gonzales (2014), an analysis is also made of the management of the use of water used by the military in camps, analyzing which portable system would be more viable for wastewater treatment, elaborating a decision matrix to list the main forms of treatment, the research obtained satisfactory results with some reservations, where, despite the choice of a method of water treatment, for that, it is necessary to adapt it to climate changes, in order to obtain good conditioning of the product, therefore, the camps could be self-sustaining and the various missions could be carried out anywhere in the world using this technology.

The study by Dalton, Arnold and White (2012) discusses actions aimed at managing water resources and producing consistent and economic measures in the military unit used by the US Army corps of engineers, which was based on the analysis of a report on climate change and water resources management, analyzing the report and developing a matrix in order to identify priorities in terms of adaptations to climate conditions. The research revealed that successful implementation of adaptation policy will help to increase the resilience of natural water resources infrastructure and reduce the potential vulnerabilities of these resources to the effects of climate change and variability. The corps of military engineers is developing and implementing the plans, policies developed, among others, so that the adaptation begins sooner for projects that are most vulnerable or most critical to sustainable performance. With this, there is a tendency to think that military units improve according to the local reality, which is more urgent at the moment, both the management of resources and the structural development of the units, are aspects that bring different actions and reactions. , the method used by the units comprises the universe of that environment, the action taken is the unit's perspective on improving its procedures. It is still difficult to establish a mutual connection with the various military units around the world, but it is possible to create internal routines based on local studies and actions from neighboring barracks.

The study by Kamauskaitè *et al.* (2019), refers to the Navy, in which it was possible to identify only one research, which also uses a sustainable assessment tool based on indicators. The tool itself would serve to support decision-making about discussions on sustainable development in coastal management in Lithuania, with the following aspects being assessed: environmental, social and economic. With the analysis of the indicators, it was proven that there is a difference between the management options that approach sustainability in the different spheres, in which both management options have some positive and negative effects on the quality of the environment. However, although the tool indicated the weaknesses of the management measure, the assessment results did not indicate what kind of solutions should be carried out. The management of the navy itself works with a focus on ports.

In the study by Kim, Min and Park (2021), it is possible to identify that the research discusses protection measures in a military unit of the Korean army, where it was sought to develop a method of protection that shields the installations against the electromagnetic

waves of the neighboring countries, reducing the use of concrete and rebar, replacing it with sustainable and long-lasting materials. The results showed the possibility of developing a light protection in the installations, thus saving approximately 316,386 tons of concrete, in addition to reducing CO2 by approximately 9,972,489 tons, that is, through the analysis of materials used for shielding, there is the possibility of implanting it. in Korean facilities, minimizing environmental impacts and strengthening their protection area.

In this research, no specific works that dimensioned sustainable projects in the barracks of the Brazilian Air Force were found. As a result, the demand for work in the field of the Air Force Military Command, on the platforms surveyed, is still scarce. The reasons for this are not known, however, it is noticeable that the direction of good management that has purposes to improve the environment in the face of sustainable local development, counts a lot for the advancement of the military unit from the perspective of environmental social responsibility.

In the readings carried out, it was possible to identify sustainable practices to minimize environmental impacts in routine activities, such as: replacement of materials, previously used in local renovations, with materials that have more adhesion, resource savings, reduction of CO2 in the environment, use of tools from management to decision support and waste management using sustainable models that ensured the most economical route of the entire process, thus supporting the relevance of working with optimism and sustainable goals.

With this, it is possible to verify that the good conditioning of the insertion of sustainable practices is essential for the good organizational progress. Thus, understanding the relevance of the research discussed, the Armed Forces, as a body of the Federal Public Administration, is a model that provides adequate environments for the development of practices and management projects that bring balance. Sustainable management provides changes in actions and conditions people to new perceptions and conservative practices, bringing quality and proactivity within the organizational scenario (TRIGO; TRIGO; MARUYAMA, 2017). In this sense, the search for initiatives to preserve the environment, in order to obtain positive results, reduce expenses, become competitive and stimulate the team, in a way that positively affects the performance of employees and conditions a sustainable life. However, it is necessary to emphasize that it is necessary within this context, actions and positioning of managers, in order to create projects, encourage new sustainable models for application in the units, strengthening of internal policy and innovation in the implemented processes.

5 Conclusion

In short, the analysis of the articles allows us to affirm that there are initiatives to improve sustainable management within military units, however, more projects still need to be developed in order to be implemented and disseminated. In the universe of works analyzed in the databases, a relevance of 90% of works aimed at the Army was obtained, followed by 10% from the Navy, 0.0% from the Aeronautics.

The initiatives taken within the Armed Forces to develop sustainable systems to improve management presented a series of themes, which can be projected in other units, giving them the opportunity to insert new techniques and management models to improve processes.

Therefore, the research brings new insights regarding the area of study to the academy, when researching published works in the area of quality management and sustainability in military units, aggregating relevant information for the knowledge of other military units and society in general.

During the study, the limitation for this was mediated and resolved, considering that some keywords used did not return with satisfactory results, however, it was possible to choose new words and search platform and, thus, bring satisfactory results to the search.

Finally, the research contributed to the collection of information based on the results obtained, models used in units that made the environment more sustainable, thus contributing to advances in future studies in the nearby units, in the sense of elaborating a model of assessment of sustainable management to the barracks.

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The history of military education in perspective: training of officers at the Agulhas Negras Military Academy (1989-2018)

La historia de la educación militar en perspectiva: formación de oficiales en la Academia Militar das Agulhas Negras (1989-2018)

Abstract: This article aims to present a brief analysis of changes in educational strategy that have impacted the way of being and thinking of the military personnel trained by the Agulhas Negras Military Academy (AMAN) over the past 30 years. For this, the survey had access to classified documents of the Brazilian Army (EB) and interviews. The political-historical backgrounds that contributed to the planning and implementation of new sectors in the AMAN in 1989 are the starting point for structural and curricular changes in the EB. The results point to the applicability of a course focused on human rights and the gradual change in treatment between officers and cadets. The focus of this article is the role of the Ministry of Defense in conducting what the military elite changed in the preparation of young officers in the context of Brazilian democracy.

Keywords: Military education; Academia Militar das Agulhas Negras (AMAN); Military elite.

Resumen: El artículo tiene como objetivo presentar un breve análisis de los cambios en la estrategia educativa que impactaron en la forma de ser y de pensar de los egresados militares de la Academia Militar das Agulhas Negras (AMAN) en los últimos 30 años. Para ello, la investigación tuvo acceso a documentos internos del Ejército Brasileño (EB) y entrevistas. Los antecedentes político-históricos que contribuyeron a la planificación y ejecución de nuevos sectores en AMAN en 1989 son el punto de partida para los cambios estructurales y curriculares en el EB. Los resultados apuntan a la aplicabilidad de una disciplina centrada en los derechos humanos y al cambio gradual en el trato entre oficiales y cadetes. El recorte cuenta sobre el papel del Ministerio de Defensa en la conducción de lo que la élite castrense cambió en la preparación de jóvenes oficiales en el contexto de la democracia brasileña.

Palabras clave: Educación militar; Academia Militar das Agulhas Negras (AMAN); Élite castrense.

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1 Introduction

The initiative of this study was based on a literature review, a documentary research, the analysis of teaching materials used from 1989, and the conduct of interviews. The documentary focus was on the analysis of reports of the former Ministry of the Army and Ministry of Defense[1], in the internal bulletins of the Agulhas Negras Military Academy (AMAN)[2] Department of Education and Research (DEP). Interviews were conducted about the changes in the narrative during the training process at AMAN, between 1989 and 2018.

Although the main values that guide the idealization of this profile have been in force by law since 1980[3], the aim is to elucidate aspects that are still little known about the instruments and strategies that changed the military profile of the officers who graduated from AMAN4 with focus on the year of 1989. That year, AMAN practically doubled its physical and administrative structure, with the inauguration of a series of permanent facilities: the Main Complex II, the headquarters of the Advanced Course, and the Guilherme Paraense Shooting Polygon, better known as the "Shooting Section".

These works were part of a strategic portfolio of the Army – the Task Force 90 (FT-90) – a set of projects that allowed, over almost thirty years, to expand and offer support for the formation of a military more focused on professional activities.

At the same time, other factors went hand in hand with the national context of transition from the Figueiredo government to democracy. According to Martins Filho (2007, p. 10), at the regional level, the Falklands/Malvinas War, which took place in 1982, provided new teachings in the military field and contributed to the process of tension between Brazil and Argentina, which was already happening. Additionally, the Brazilian military structure was quite similar to that of its Argentine neighbors[5]. As a result, the political-military results of the conflict6 in the south of the continent motivated the transformation of the Brazilian Army (EB) in the 1980s (ALVES; CAMPOS, 2012). In this context, General Walter Pires

1 The Ministry of the Army changed to the Army Command in 1999, with the creation of the Ministry of Defense.

2 The Agulhas Negras Military Academy - AMAN, as an establishment of higher military education, is heir to the bicentennial tradition of training the junior officer and the unskilled captain of the military education line of the Brazilian Army, begins the training of the military chief (BRASIL, 2011a). A military graduate from AMAN is equated with university education and receives a bachelor's degree in Military Sciences, in accordance with the Army Education Law (BRASIL, 1999).

3 Military Statute (E1) - Law No. 6880, of December 9, 1980 (BRASIL, 1980).

4 When summoned by the Minister of the Army Leônidas Pires Gonçalves, the Colonel of the Staff of Military Engineers (QEM) - formed by the Military Institute of Engineering - Cláudio Meirelles Santos expressed the opinion of the minister that nothing should be done without a deep study to, not only expand, but also adapt the AMAN, so that the cadets have the same standard of modern colleges, with the use of computers, videos, etc. He also said that a solution should be given to allow it to be, like the first, proud of those who passed by, adding value for another 50 years of use and, still, keeping a memory of its glory times (VELLOSO, 2010).

5 In 1982, the military government was still in force in Brazil, under the presidency of General João Baptista Figueiredo. Wars were topics that naturally received special attention from the government. Its Army was, until the 1970s, the traditional adversary in the hypotheses of employment and war games developed by Brazilian military schools. Its equipment and doctrine were very similar to that of the Brazilian Army. The same inclination towards counterinsurgent warfare, at the expense of preparing for conventional fighting, was found. It seems logical to think of the Brazilian government and Army as attentive observers of the conflict (ALVES; CAMPOS, 2012).

6 For example, the war revealed the impotence of the Organization of American States (OAS) and the Inter-American Treaty of Reciprocal Assistance (TIAR). As demonstrated by the ineffectiveness of these instruments during the war and the ostensible support of the United States for its British ally, such organizations were functional only when they responded to the interests of the northern superpower. Brazilian diplomacy was attentive to this lesson (CERVO; BUENO, 2002).

(1979-1985) and, successively, General Leônidas Pires Gonçalves (1985-1990), ordered the Army General Staff (EME) to plan the restructuring of the Force, providing the continuity of the project that was in progress since the 1960s (PEDROSA, 2018), but with a focus on the panorama of the 1980s, where the Falklands/Malvinas War had an important influence. Thus, in 1984, within the scope of the EME7, the Army Planning System - SIPLEX[8] arose. This plan lasts, with adaptations, until the present time[9].

The professional training of officers in the military education line (LEMB) is the main thread in the career of future commanders of the Brazilian Army (EB). In the last thirty years the EB educational system, especially the Department of Teaching and Research (DEP)[10] posed a great challenge in trying to objectively assess the revised military attitudes and values in the Military Statute. The year 1989 also brought contributions to the theoretical field of History. That same year, the History of the Present Time (HTP) in France started, with Pieter Lagrou as one of its greatest collaborators. Although the Institute of the Present Time History (IHTP) was created in the 1970s, Timothy Garton Ash published a book called The History of the Present (1999) in which he defends the practice of a recent history, made of interviews with the protagonists and full immersion in the events (PÔRTO JÚNIOR, 2007).

At AMAN, this guideline was also reflected in the expansion of its physical structure (works started in 1987 and inaugurated in 1989), practically doubling the capacity to train officers, with the aim of, in the future, facing the increase in personnel that was envisioned in the FT-2000 and FT-21 Projects. AMAN is the military educational establishment responsible for the training of most of the career officers of the Brazilian Army. At the Academy, the main values of the Land Force's organizational culture are developed in the cadets, which will be cultivated throughout the officer's career. Since 1964, its courses have lasted four years, divided into two phases: Basic Course[11] and Weapons Courses. There are seven specialties conducted there: Infantry (Inf), Cavalry (Cav), Artillery (Art), Engineering (Eng), Communications (Com), War Material (MB) and Quartermaster (Int). Teaching at AMAN includes two major areas: Elementary Education (so-called "university" disciplines, in the areas of Exact Sciences and Human Sciences, for all courses) and Professional Education (military disciplines, common and specific to each course).

7 The General Staff of the Army is the general management body (ODG) of the Land Force, responsible for coordinating the action of all sectors of the EB.

8 SIPLEx is the set of measures and actions of the State, with emphasis on military expression, for the defense of territory, sovereignty and national interests against predominantly external threats, potential or manifest (BRASIL, 1984b).

9 According to Kuhlmann (2007) the possibility of adaptations was already part of the system from the beginning.

10 Since 2009, the DEP has been renamed the Department of Education and Culture of the Army (DECEx).

11 From 1964 to 1976, the Basic Course covered the first two years; from 1977 to 1987 it was reduced to one year and, in 1988, it returned to the previous two-year conformation. In addition to concentrating so-called "basic" disciplines, both in Elementary and Professional Education, it allows for a period of coexistence and mutual knowledge, aiming at a better future interpersonal relationship, since the cadets will be further divided into different weapons/services.

In order to enable the achievement of the research in question, internal documents of AMAN were researched, such as the internal bulletins (BI AMAN). Regarding the methodology, the present work is based on the contributions of José D'Assunção Barros (2013). For oral history, the works of Ferreira and Amado (2006), Alberti (2013) and Cardoso and Vainfas (2012) were consulted. Publications related to military ethics were also consulted on the Capes Journal Portal. The military and former military personnel interviewed signed the Informed Consent Form (TCLE), which, in turn, was sent to the Ethics Committee of the Salgado de Oliveira University (UNIVERSO). The texts underwent a discursive analysis (MAINGUENEAU, 2008). Therefore, this article is in accordance with the following classifications: regarding the type of research (or objective), it is an applied research, and, with regard to the methodological procedures, it is a case study based on bibliographic review and documental research.

2 Development

The training of officers in perspective of the military education line

The socialization of LEMB officers begins even before entering the academic gates. The rigid selection processes established in public notices verifies the social situation of the candidates, by proving that they do not have a criminal record in the national public security registry. Once approved, the "still" candidate is submitted to the basic notions of the institutional culture during the adaptation period, which lasts for approximately fifteen days[12]. At this initial moment, manuals are distributed, of which the Military Statute[13] (BRASIL, 1980), the General Services Internal Regulations[14] (BRASIL, 2003) and the Army Disciplinary Regulations[15](BRASIL, 2002) are distributed. After one year of preparatory education at EsPCEx, once approved, the student will be able to join AMAN.

The process also involves the development of other moral values that should guide their actions not only throughout their careers, but throughout their lives, as long as they are considered military, even if they are no longer in active service. The search for these values is guided by the "predominant idea" of honor, which must accompany the military and promote conduct that leads to being considered worthy of officialdom and the defense of the homeland. For Rosinha and Andrade Júnior (2020) the armed forces prepare young people to exercise the role of defense and security in a social context in constant transformation and work by ideology, simultaneously

12 With the exception of some sporadic open tenders for immediate entry into AMAN (2004 and 2011), entry into the LEMB takes place through approval at EspCEx. In this educational establishment, the student learns in one year the basics of the military profession and has contact with the members of AMAN.

13 The present Statute regulates the situation, obligations, duties, rights and prerogatives of the members of the Armed Forces (BRASIL, 1980).

14 The Internal Regulations and General Services (R - 1 or RISG) prescribes everything related to the internal life and general services of units considered troop corps, establishing norms regarding the attributions, responsibilities and the exercise of the functions of their members (BRASIL, 2003).

15 The Army's Disciplinary Regulation (R-4 or RDE) aims to specify disciplinary transgressions and establish rules regarding punishments, military behavior of the soldiers, resources and rewards (BRASIL, 2002).

to ensure their own cohesion and reproduction of the values they project abroad. There is no pure ideological apparatus, but the "school, whether civil or military, is a dynamic political space par excellence" (PALMA ROSINHA; ANDRADE JÚNIOR, 2020, p. 132).

According to article 36 of the Regulations of the Agulhas Negras Military Academy, AMAN courses also aim to form a basic military personality, with a solid ethical structure and strong attitudinal development, all in accordance with the professional profile established by the Army General Staff (BRASIL, 2014). Dênis de Miranda (2019) verified in his doctoral thesis that military ethical training would be a improvement of the ethical and moral standards proposed in the Law of Directives and Bases of National Education (LDBEN) (BRASIL, 1996). For Miranda, the development of structured thinking has a similarity to what LDBEN calls critical thinking. This construction appears in the military text as a behavior that the Army values in those concluding its teaching modalities (MIRANDA, 2019). It is noteworthy that, according to article 35 of the LDBEN, ethical training has its focal point during high school (BRASIL, 1996), without any mention of higher education. However, the derivations of the military structuring axis are stimulated so that military values are spontaneously manifested at the end of the teaching process.

In order to operationalize the reproduction of expected values in an environment of increasingly rapid transformations, tensions were evidenced between the rupture of teaching strategies and the continuity of traditions solidified over time. Sueli Magalhães shared some of the dichotomies that made the Teaching Modernization Process (PME) in the late 1990s and early 2000s a major challenge:

> This updating of the military ethos of teaching took place in favor of a pedagogical rationality centered on completely opposite values and categories of analysis: instead of the absolute subordination of the individual to the group and to the Institution (holism), the consideration of the emotional and cognitive needs of the students; instead of the unrestricted primacy of hierarchy, the mention of rational-legal criteria for the exercise of leadership; instead of the omnipresence of radical asceticism, the defense of the eventual use of the principle of pleasurable learning (MAGALHÃES, 2010, p. 2).

Accordingly, Celso Castro (2004) lists a series of attributes that, in his research, appear to be valued by cadets and that, in this perspective, are considered complementary and necessary for the exercise of honorable conduct, such as: seriousness, professionalism, competence, maturity, discipline and order. It is interesting to note that these values must result in "irreproachable moral and professional conduct", as established by military duties related to ethics (BRASIL, 1980). They are, therefore, values whose pursuit are encouraged and which should result in actions and attitudes regulated by statutes that apply internally to the corporation. In addition, the cultivation of these values must also establish an evident behavioral difference between the military and civilians, culminating in a separation of the military from the civilian world.

The perception of military attributes as examples of true ethical and moral values, as well as sacrifice for the country, permeated a speech by General Antônio Hamilton Martins Mourão on the occasion of the celebrations of the fiftieth anniversary of the death of Sergeant Argemiro de Camargo, victim of a guerrilla ambush in 1965. According to Zatta and Vannini (2018), the general's speech reaffirms the military view of the "Redentor" (the movement of March 31, 1964), in addition to implying the idea that the Brazilian Army saved the country from a communist dictatorship. Also, according to these authors, the year 2015 marked the resumption of the institutional discourse with a political position favorable to the Military Regime (1964-1985) (ZATTA; VANNINI, 2018).

In addition, the use of the uniform and its insignia become part of the routine of student candidates in a military school, where this is evaluated by the three documents mentioned above. In the case of the student in a LEMB training course, the ornaments created receive special attention. This is because some uniforms were made specifically for this purpose.

In the first year of AMAN, the then cadet[16] wore the historic uniform called "*Azulão*". Additionally, during the soldier's week, the cadet receives the marlin, a reduced copy of the sword that the Duque de Caxias received for his services to the Army and the Empire of Brazil. The date is celebrated around August 25th, the birthday of Luís Alves de Lima e Silva[17]. It is worth highlighting the role of Colonel José Pessoa Cavalcanti de Albuquerque in changing the career profile of LEMB. According to Celso Castro:

> With the creation of the Cadet Corps, the student enrolled in the school began to be considered part of a collective entity [...]. The main control that the new disciplinary precepts would be followed should be the conscience of the cadets themselves, through the creation of what José Pessoa called, in his autobiography, "a new psychological state", which would make each one a "slave of his personal dignity" [...]. Each cadet was a prisoner of himself. And we can affirm, there was no more solid prison. The main goal was therefore to reach "the soul and heart" of young officer candidates. Therefore, his most important initiatives – and the most lasting ones – were on the symbolic level [...]. First, the cadets' uniforms were changed [...]. The artist José Washt Rodrigues was asked to help create the new uniform plan. Military uniforms of the Empire were adopted, mainly from the 1852 campaign against Rosas[18]: shako,

16 The cadet, title of noble origin, put into disuse at the beginning of the republican period, gained new contours. On August 25, 1931, the "Cadet Corps" was created by Colonel José Pessoa, in a ceremony attended, among other authorities, by the President of the Republic, Getúlio Vargas (CASTRO, 2002, p. 42).

17 Luís Alves de Lima e Silva – the Duke of Caxias – is the patron of the Brazilian Army. Born on August 25, 1803, his military career is a prominent target in the face of military and political achievements inside and outside the Brazilian Empire. As a result, he was elected with the title of Duke, second in the nobility scale. From 1923, the date of his birth began to be celebrated, with greater relevance, until it received the name Army Day. Currently, August 25 is celebrated as Soldier's Day, accompanied by specific rites such as military graduations, the pledge of allegiance ceremony and the marlin pledge for AMAN's first-year cadets.

18 Juan Manuel de Rosas ruled the Argentine Confederation between 1835 and 1852, being defeated by troops led by Caxias in the Battle of Monte Caseros, in Argentine territory, on February 3, 1852. This was the only historical fact in which the main powers of the South American continent, Argentina and Brazil, faced each other militarily and its result influenced the choice of uniform for AMAN cadets.

> cords with paddles and tassels, palm and scarlet paddles and a symbolic emblem for the covering. The predominant color was turquoise. The most important element became the marlin (CASTRO, 2002, p. 42-43).

As a result of the attention given to the creation of new devices and artifacts, the cadet began to receive a more rigid treatment, under a more closed control. Sociologist Erwin Goffman[19] argues that reciprocal influence occurs when partners exert physical presences on each other over their respective actions. In military education, the most intense and lengthy process of socialization of all technical and higher education takes place.

The boarding school system, with more than 10,000[20] (ten thousand) hours of class or instruction of professional courses, is divided by means of military maneuvers and field exercises. This long period of at least five uninterrupted years is considered an isolation system compared to a "bubble" or "a world apart" (CASTRO, 1990). Later, the author would classify the military institution as "totalizing"21 (CASTRO, 2007) instead of total, in reference to the study by Canadian Erwin Goffman (1971), in attention to details collected through participant observation developed between 1987 and 1988, at AMAN.

Table 1 – Differences between the total institution (Goffman) and the totalizing institution (Castro)

Goffman (1971)	Castro (2007)
In total institutions, what is sought is not a "cultural victory" over the inmate, but the maintenance of tension between their domestic world and the institutional world. This persistent tension is used as "a strategic force in controlling men.	In a military academy, what is sought is precisely a "cultural victory" and not a "persistent tension": the academy is clearly seen as a place of passage, a stage to be overcome.
There is a rigid division between the management team and the inmates.	There is no strict division between "management team" and "inmates". In the military chain of command there is no separation of the same nature.
It deals mainly with establishments with compulsory participation (prisons and asylums).	In a military academy, only those who want, stay.

Source: Adapted from Castro (2007).

19 In the case of the total institutions described by Erwin Goffman (1971), related to closed life and with defined schedules, it is possible to analyze some aspects. From waking up, "dawn", to bedtime, also called "silence", is a common norm in military training schools, particularly in AMAN, and its counterparts, in other FFAA. These stages are phases of daily activities programmed within narrow lines, representing an activity conducted at the predisposed time for the next (GOFFMAN, 1971, p. 305).

20 Curriculum of the Agulhas Negras Military Academy (BRASIL, 2016).

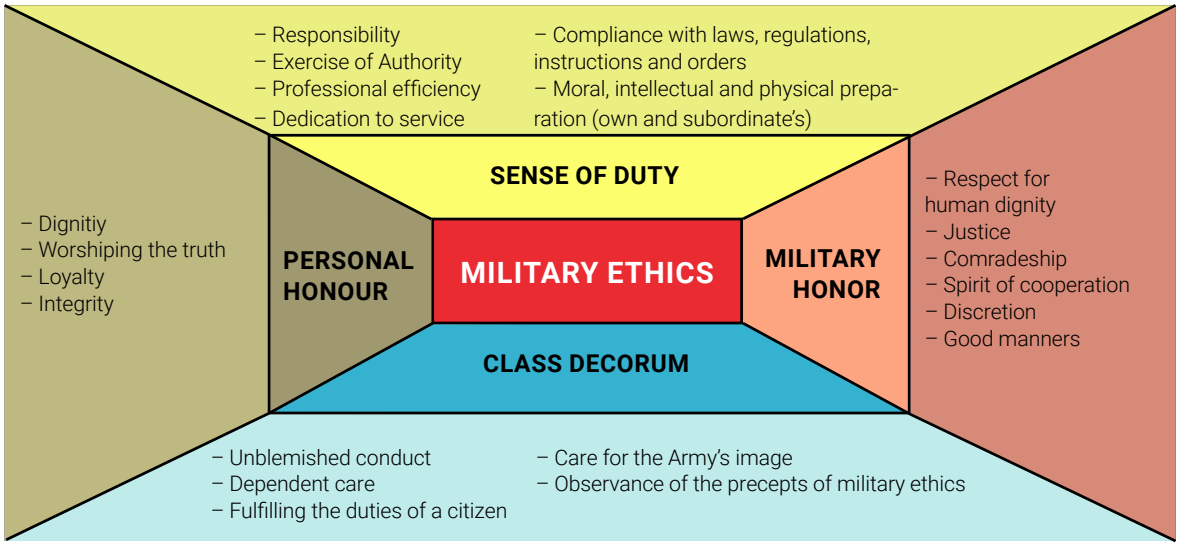
21 Castro refers to the word "totalizing" to qualify the act of attributing a total character (CASTRO, 2007, p. 5). The discourse points to a differentiated world between the "paisanos" and the "military", in which the cadets perceive themselves in a "differentiated" process from what occurs in civilian higher education establishments.

The cadet's code of honor initiates the military in the development of four fundamental duties: truth, loyalty, probity and responsibility (BRASIL, 2014, p. 24). However, the Army Military Ceremonial Vade-Mecum - Military Values, Duties and Ethics (BRASIL, 2002a) lists and categorizes, of these four duties, just two: loyalty and probity.

The result is the fusion of countless concepts, which are not always strictly defined and some even redundant, to which the cadet is submitted during the five-year training. As an example, the figure below shows the repetition of the item "Fulfillment of the duties of a citizen" (Class decorum), without even an instruction on the scope of the topic. Another factor is linked to "Observance of the precepts of military ethics" within the instructional diagram itself, resulting in observation as a communicative link.

Thus, the item exercise of authority and professional efficiency lack situational explanation, leaving the issue strictly to manuals and regulations. To mitigate the different situations in which cadets are evaluated, the military education system has sought to contextualize situations that the future officer will face in the exercise of command of small fractions, which is still an objective to be achieved, even after two great teaching projects. Truth and responsibility are part of the military ethics plan, but do not have a specific institutional definition. Additionally, the Vade-Mecum has other statements that lack objective meaning, as shown in the figure below:

Figure 1 – Diagram on Military Ethics



Source: Brasil (2002b, p. 10).

The additional duties listed in this document are the result of the gradual change in the "desirable military profile" to meet public policies under the democratic context. By definition, public policies are the field of knowledge that seek, at the same time, to "put the institution into action" and analyze this action and, when necessary, propose changes

(SOUZA, 2015, p. 111-112). The objective is to interfere in the perception of relevance to society and to military commanders, inspiring credit and confidence to legitimize military struggles in the face of changes in the political scenario.

Oliveira (1994) discusses the identity crisis of the reason for the existence of the military apparatus, in which tensions with Argentina would be overcome after the creation of the Southern Common Market (MERCOSUL) and the inexistence of the bipolarity between capitalists and socialists after the fall of the Soviet Union in 1991. The military educational reassessment culminated in the creation of the Working Group for the Study of Teaching Modernization (GTEME), in accordance with Ordinance No. 26, of September 6, 1995 (BRASIL, 1995). Such a perspective was an important step in military thinking, because, on the one hand, it represented the core of the doctrinal change aimed at the actions that were taking place at that time around the world. General Carlos Alberto Pinto Silva gives a brief overview of this new scenario:

> Global threats, in the current juncture, are rapidly changing: cyber warfare; information warfare; psychological warfare and clandestine operations; influence and interference in elections; weapons of mass destruction and their proliferation; terrorism, counterintelligence and destructive technologies; threats to economic competitiveness; and transnational crimes are just some of the resources widely used, in conjunction, as non-military alternatives, aimed at complementing, supporting, expanding and, above all, avoiding formal confrontation, and wearing down political, economic, social, military information forces and the command and control infrastructure of opposing forces (SILVA, 2019, n.p.).

The general classified this current order as "War of the new generation", characterized by the presence of states and non-state groups, by the considerable increase in the power of small entities, but marked by blind loyalty to their cause, that go beyond any international borders and challenge the power of the great nations. For this purpose, the small military fractions[22] were given a heavy responsibility in making decisions in an uncertain environment.

The scenario implies the constant need for change and foresight, unlike the previous scenario, in which the formation of an army was focused almost exclusively on defense in the face of external state aggression, either by a country or by a coalition of national states, as was the case during the Cold War period (1947-1991).

On the one hand, EB gradually employed the concepts of "Subsidiary Actions"[23] to military schools through curriculum changes. On the other hand, the EME team worked to seek autonomy in the legislation of military education in order to meet its peculiarities, seeking a specific path of integration of civil and military education, as provided for by article 83 of the

22 The small fractions highlighted are: the Squadron – a group of four soldiers commanded by a corporal; the Combat Group – composed of nine soldiers, commanded by a third sergeant; the Platoon – commanded by an aspiring officer or lieutenant, with a staff of 36 to 50 soldiers.

23 The Subsidiary Actions, as they were called in that 1990s, were the new missions that were being given to the military, on the world stage, after the 1980s, such as the fight against drug trafficking and organized crime, the UN peace missions and humanitarian actions.

Law of Directives and Bases of the National Education (BRASIL, 1996). Magalhães (2010) stated that during the implementation of the PME it would have contributed to the softening of the secular trend of the military's missionary role in national political life, since it blurred the differences between civilians and military personnel. This contribution legitimized democratic values and concepts in force in national education and in Brazilian society as a whole.

As a result of these multiple efforts, military education laws[24] were approved a few years later, granting educational authority to the three military forces (PEREIRA, 2016). In an interview, the former Army Minister Gleuber Vieira pointed out the motivation for the changes:

> Initially, it is necessary to understand as modernization of the Army Education System, the continuous process of adoption of a new pedagogical approach. According to this model to be adopted, the school no longer intends to teach everything. It selects a core of basic knowledge to teach to its students. They must actively participate in the teaching-learning process, experimenting, researching and working in groups, exploring doubt and error, manifesting their talents, using the available techniques in the search and selection of the knowledge they build. A holistic sense of military education is sought, so that it is able to manipulate models and **interact with the society to which it belongs**.It must be flexible and adaptable to new generations of technologies (VIEIRA, 1999, p. 5-6, emphasis added).

This concept, adaptable to the educational process, allowed the insertion of duties that were not previously listed in the Military Statute. In Law No. 6,880 of 1980, only the values and principles of military ethics are listed, thus lacking provisions in legal form for the definition and exercise of rules. However, school regulatory inserts25 were dedicated to filling this gap, assigning the cadet new rules to follow. To amalgamate these insertions, the figure of the hero, built from patriotic historiography, contributes to the formation of a collective identity.

> Traditionally, Military History has been the history of the wars, campaigns, battles and deeds of great generals, as well as the record of all the activities of military forces in war and peace. The phenomenon of war has evolved from a purely military dimension to a total dimension, in which military operations are no longer restricted to a limited space known as the battlefield, but affect society as a whole.

24 Navy Education Law - Law No. 11,279, of February 9, 2006; Army Education Law - Law No. 9,786, of February 8, 1999; and Aeronautics Teaching Law - Law No. 12,464, of August 4, 2011.

25 In addition to the contents covered by the Commander's guidelines at the beginning of the school year and at AMAN's morning graduations, some contents seek to offer references to military ethics, such as, for example, the Student Manual of the Army Cadet Preparatory School (EsPCEx), the Regulations of the Agulhas Negras Military Academy (EB10-R-05.004) (BRASIL, 2014), the Cadet Educator's Ideas, edited by General Marco Antônio de Farias in 2000, the "Cadet Life" by Colonel Nilson Marques de Souza (SOUZA, 2013, p. 108), the letter entitled "Cadet's Day" by Colonel Nei Paulo Panizzutti (1998), the General Rules of Action (NGA) and the specifications of the Rules for the application of disciplinary punishments (NAPD).

> Traditional military history has been the field of "military historians". In general, it has little methodological acuity, as it is not the result of the work of professional historians, but of enthusiasts. It tends, therefore, to grandiloquence and excessive adjectivation. It is basically a descriptive story and seeks the ideal of presenting "the facts as they happened". Due to these characteristics, it became known derogatorily in the United States as **"Battle-History"** or "Drums and Bugles" History. Due to its non-specialized and "corporate" origin, it has a clear tendency towards myth, the praise of historical figures and a certain condescension in the judgment of the facts and protagonists (PEDROSA, 2011, p. 2-3, emphasis added).

According to Pereira (2021), traditional historiography has been criticized for only narrating the facts "as they really happened", analyzing the history of leaders and offering a view from above. Additionally, traditional historiography was based on official documents, vetoing alternative methodologies that would contribute to the political-social perception of the time. It has become the discovery of history as a process of directional change, development or evolution.

> Faced with the overwhelming reality of transformation, even conservative thinking becomes historicist. A kind of historicism, that is, the more or less sophisticated and complex extrapolation of past trends. For the future, it was the most convenient popular method of forecasting. History as a "main line of life", in which the phenomenon tends to repeat itself given some similar circumstances, represents the trap for those who intend to write and analyze the phenomenon only based on facts, disregarding geographic and historical-cultural influences (PEREIRA, 2021, p. 67).

The enunciation of military values and duties, inspired by Caxias, recognized by historians for their loyal attitudes to the current power, a remarkable role within the military institution. However, has mythification brings problems to the image that one wants to convey to soldiers. When the studies on the origin of Francisco Alves de Lima e Silva, the Duke of Caxias, are deepened, it is observed that family ties are permanently linked to the military institution, for political purposes. Souza (2018) described the social configuration with which parents, grandparents and uncles lived in an army along the lines of the "Old Regime", in which, for a long time, it reproduced itself as a "split force", constituted by an officer recruited between the first echelons of the nobility and a soldiery made up of the scum of the population (SOUZA, 2018).

By making a brief analysis of the didactic material used in the teaching activities of AMAN since 1989, it is possible to verify the linear and factual approach of the main military events in which the patrons, especially Caxias, actively participated. Rémond (1996) criticizes this approach to political history. Desiring to get to the bottom of things, to capture the core of reality, new history considered durable structures more real and decisive than the accidents of conjuncture.

> Political history presented a configuration that was exactly contrary to this ideal history. Study of structures? It only had eyes for the most superficial accidents and circumstances: exhausting itself in the analysis of ministerial crises and privileging breaks in continuity, it was the very image and the perfect example of the so-called factual history, or événementielle — the term being evidently in the bad sense — which stays on the surface of things and forgets to link events to their root causes. By privileging the particular, the national, political history deprived itself, at the same time, of the possibility of comparisons in space and time, and generalizations and syntheses were prohibited, which alone gives the historian's work its scientific dimension (RÉMOND, 1996, p. 16-17).

The linear narrative, based on the positive facts of rupture of the "heroes" confers an aura of predestination, embodied in the cause and effect relationship, which restricts the audience to the manifestation of contradictory arguments. In this aspect, the Triple Alliance campaign (1864-1870) received special attention as it was the genesis of almost all patrons until 1962[26]. In structuring the Military History book (1979), the division of subjects is similar to the content of technical-military manuals where historical facts are analyzed according to the fundamentals of the art of war: organization, equipment, instruction, moral forces, and employment. Such foundations belong according to the terrestrial military doctrine (BRASIL, 1979).

The concept of doctrine points to the set of teachings that is based on a belief system. They are the principles that exist on a given issue, usually for the purpose of universalization. The notion of doctrine is also related to the body of a dogma, formed by certain and irrefutable statements. In the case of military doctrine, it is the set of techniques, strategies, tactics and practices that constitute an armed confrontation in which the steps to win a war are proposed.

When talking about Military Doctrine, Pedrosa (2011) refers to the set of knowledge and practices formalized in doctrinal "manuals", encompassing: the structuring and preparation of forces; its armament and equipment; and the rules for employing them in combat. In this scope, Azevedo (1998) prepared an itinerary for the "analytical campaign study" in three chapters, as shown in the following table:

26 The patrons of the Signal Corps and of the Board of Military Material were related to specific contexts, the first being Rondon, for his contribution to communications in the countryside of Brazil (BRASIL, 1962, 1963); and Napion, for being responsible, among other outstanding achievements, for the direction of the Royal Military Academy (1811), embryo of the Agulhas Negras Military Academy (BRASIL, 1966).

Table 2 – Analytical study of campaigns

Chapter I The elements of drama	Chapter II The drama	Chapter III Lessons from the campaign
• The context. General situation; • The causes; • The theater of operations; and • The actors (the forces present and the leaders).	• Coup view of the set; • Development of operations; • Conclusion. The peace. The objectives achieved.	Appendix: detailed study of some interesting episode of the campaign; This will be the most didactic way to study a campaign; and It is possible that the study of all campaigns is not always done taking as a model what has been exposed, but we will not stop **to advocate this seriation as necessary and fundamental**.

Source: Adapted from Azevedo (1998, p. 36-37, emphasis added).

In this aspect, military history books from the 1980s and 1990s mostly do not present historiographical discussion, indicating that the subjects addressed directly and synthetically are finished from the military-historical point of view. There is confusion whether when the story ends and when the doctrine begins, within the context of the battle-story (KEEGAN, 2006b). When presenting another work by John Keegan (2006a), Colonel Luiz Carlos Carneiro de Paula, a member of the editorial board of the Army Library (BiBliEx) admits the need for a broader analysis of military history:

> The division of the study (from Keegan on the Second World War) into Controversies, Histories, Biographies, Campaigns, Intelligence and War Economics, and finally Occupation and Resistance constitutes a good itinerary for the student of Military History and serves as the historian's job is laborious, especially the one who has war as an object of historical research. Treating it like a military operation just might be the easiest. But finding all the interfaces of it as a political, economic and social phenomenon, particularly the latter, is a challenge. It is a good time for BiBliEx to publish this book. It will come to meet a need in the military and academic circles to update and dynamize the study of Military History among us (KEEGAN, 2006a, p. 6).

According to Ferreira and Amado (2006, p. 49-51) there is both a political oral history and an anthropological traditional history that were developed especially after the Second World War (1939-1945). To make this possible, young people from Italy and France began to collect reports from their grandparents in order to create a national memory – and this memory dialogues with the new military history, especially in the context of the (re)creation of an institutional

ethos. Even if the objective is not the training of historians, but of the military, the study of military history should awaken a taste for the matter, currently being offered as an institutional, academic course. This challenge, which can be seen as current, is reported in the preface to the book by Apelo General Jonas, former cadet of Professor Pedro Cordolino Ferreira de Azevedo (1884-1958), in 1945:

> Its scope was wide: the time allotted to it was very little – totally insufficient, even in a complete program [...] learning depended on the students' efforts; teaching, of teachers who, as much as instructing, should – even with more emphasis – attract interest and motivate (AZEVEDO, 1998, p. 5).

The doctrinal compendium (BRASIL, 1979) recommends a complementary study to deepen knowledge, as well as the reading of books and manuals[27] edited by the Brazilian Army (BRASIL, 1979). Such contents are books written by the military between 1950 and 1978, where strictly military factors were highlighted and factual narratives were preserved, characterizing the evolution of war and military doctrine (PEDROSA, 2011). Thus, the notion of ethos allows, then, to reflect the more general process of subjects' adherence to a certain position (MAINGUENEAU, 2008).

Everton Santos (2012) states that an institution reflects, through its rites, its deepest values, the most intimate of its ethos, spirit and essence (SANTOS, 2012, p. 81). As it is typical of symbolic discourse, the ritual highlights certain aspects of reality, giving a close-up on things in the social world, that is, making them clearer (DAMATTA, 1997, p. 76-77)[28]. The needs of discipline in military institutions are of importance when we pay attention to the Weberian function of the administration of violence. Military professional education works with weapons and equipment aimed at the art of war, within the constitutional principles and according to the legislation in force. Thus, intensity is related to the two basic assumptions in the military institution: hierarchy and discipline.

As a result, military personnel pursuing careers must strictly follow what is provided for in curriculum plans and guidelines. They shape, within themselves, the attitudes desired by their superiors. Under the penalty of not being promoted in the hierarchical

27 AZEVEDO, P. C. *História Militar Geral*. Rio de Janeiro: Imprensa Nacional, 1950 (coronel); BENTO, C. M. *Como estudar e pesquisar a História do Exército Brasileiro*. Brasília: EGGCF, 1978 (coronel); BRASIL, Ministério do Exército. Secretaria Geral do Exército. *Marechal Castello Branco – seu pensamento militar*. Rio de Janeiro: Escola de Estado-Maior do Exército, 1968; MAGALHÃES, J. B. *Civilização, Guerra e Chefes Militares*. Rio de Janeiro: BiBliEx, 1959 (coronel); RAPOSO FILHO, A. A manobra na Guerra-Síntese filosófica. Rio de Janeiro: BibliEx, 1960 (coronel); e RUAS SANTOS, F. *A arte da guerra*. Resende: AMAN, 1960 (coronel).

28 Focusing on value systems and fundamental orientations, T. Parsons (1966) proposed a complex typology. We return, therefore, to the question posed by A. Giddens on structural principles research: "What are the levels of abstraction that are worth distinguishing in the study of the structural properties of social systems?" In order to answer, he abandoned the formal side of the task to **search for "elements closer to the empirical content"**. He thus defined the structural principles as "principles of organization of societal totalities" (JOHNSON, 1997, p. 429, emphasis added).

scale, or even being fired, punished or summarily prosecuted[29], from a disciplinary point of view, they comply with orders, without further challenges or considerations. In fact, the "ponderer" is seen as a bad example to be followed and may be the target of hostility towards superiors and even among the companions themselves.

According to França (2020), there was an emblematic case involving the death of a cadet in military training at AMAN, in 1990. The course of the judicial process, which had the latest information in 2018, brought the possibility of changes celebrated in agreement with the family of the deceased cadet. As a first symbolic aspect, a military ceremony took place in 2012, with the addition of the inauguration of a plaque honoring the cadets who died during instruction throughout the Officer Training Program.

The plaque is in the facilities of the Basic Course (1st year) of AMAN, close to the commanding post of the commander, sending a clear symbolic message to the body of instructors in memory of this and other tragic facts involving trainees that occurred in military training. The Basic Program was chosen because the deceased cadet was in his first year at the Academy and this fact reactivated the practice of honoring students who died in instruction.

Image 1 – Plaque honoring the dead in instruction[30]

Source: AMAN, 2019.

29 Process of investigation of disciplinary transgression that underwent changes with the entry of the democratic regime. Until the beginning of the 2000s, the investigation was carried out in a summarized way, and without the possibility of contradictory and ample defense, capital data of article V of the Federal Constitution of 1988. The soldier under investigation was submitted only to a verification rite called "the duck hour". It is worth noting that at this point: the name alludes to an hour-long Sunday freshman program that was very successful on Rádio Nacional from 1943, during the Second World War. Starring Héber de Bôscoli, later replaced by other presenters, such as Paulo Gracindo, Aurélio Andrade and Jorge Curi, the program consisted of evaluating the performance of candidates for professional singer, offering them the opportunity to show their talent "live". When the result was not satisfactory, the announcer "sounded the gong" with the sound of quacking ducks – sung by the broadcaster and voice actor Cahuê Filho – to keep the candidate away from the microphone when he was out of tune or made another mistake. The failed postulant was still booed by the audience, characterizing the punishment for his lame *performance* (IRDEB, 2019; RÁDIO NACIONAL, c2009). After the reissuing of the Army Disciplinary Regulation (BRASIL, 2002a), constitutional provisions were inserted in the process, allowing the investigated to put, in writing, information that is recorded in the files of the subunits (companies) under which the military is assigned.

30 "Homage from the Brazilian Army and the Agulhas Negras Military Academy to the cadets who died in instructional activities during the Officer Training Program". "Homage from the Brazilian Army and the Agulhas Negras Military Academy as a result of the Friendly Settlement Agreement with the Inter-American Commission on Human Rights, referring to Cadet Lapoente da Silveira."

After the inauguration (2012), the rite of celebration and homage to the dead started to be repeated when there are deaths of cadets. Piovezan (2014) draws attention to the large number of commemorative plaques honoring the dead, although not in wars, realizing their political use in funeral moments:

> An interesting aspect in the way death is remembered in these moments is the discourse used to convey this information [...]. Such expression refers to a greater drama of the event (war) which is already tragic, but which uses the idea of voluntarism of the individual who was killed for France. These plaques that refer to French funeral monuments can be compared with the idea that the soldiers died for a cause, which is the French homeland (PIOVEZAN, 2014, p. 217-218).

However, the memory exercise, in the case of accidents at work, was treated under another bias. History is not only a narrative of memory, but also of forgetting (RICOEUR, 1990). As a result of the progress of other international processes31 involving the death and forced disappearance of guerrillas from the Araguaia campaign, it was added to the curriculum of AMAN, in agreement with the Inter-American Commission on Human Rights (IACHR) of a course specifically designed for this purpose. The negotiations took place between the Ministry of Foreign Affairs and the Ministry of Defense (BRASIL, 2011a).

Another factor that added to the demand for the creation of the new course was the commitment made through the National Defense Strategy (END) (BRASIL, 2008a). Normative Ordinance No. 916/MD (BRASIL, 2008b) established the guideline for the dissemination of the concept of International Law of Armed Conflicts (DICA) in the Armed Forces, which represents a set of international norms of conventional or customary origin, intended to be applied in armed conflicts and which, for humanitarian reasons, limits the rights of the parties to the conflict [...], as it seeks to protect the people and property affected by said conflicts (BRASIL, 2008b, p. 1).

3 Results

The result was the structuring of a 20 (twenty) class-hour human rights course, mandatory for military schools, with the purpose of instructing the military who can participate in UN peace operations and law and order enforcement actions (GLO) (BRASIL, 2011c), guiding the content with "the ethical and moral values related to the practice of human rights (BRASIL, 2011c). The theme mobilized the Directorate of Higher Military Education (DESMil), involving the training, improvement and staff schools for

31 In the historical context of transitional justice from practices considered dictatorial to democracy, a set of normative measures was carried out, inspired by the claims of victims of exceptional regimes, indispensable for achieving the reestablishment of social integration mechanisms. Such normative measures encompass an indicative content in four items of how to act in the best way from a moral perspective. First, access to the truth; second, the search for justice in the sense of civil, administrative and criminal accountability of state agents who committed crimes against humanity; third, the reparation of victims; and, finally, the need for institutional reforms that guarantee the resumption of the democratic process (BAGGIO, 2014, p. 96-97).

the elaboration of a synthetic framework to enable the course called "Military Professional Ethics" (EPM) (BRASIL, 2012). However, the implementation of the EPM was completed in 2015, three years after the start of the inter-institutional dialogue. The minimum syllabus of the first part, with seven semesters, involved the following human rights themes:

> List of international acts of Brazilian diplomatic practice; Universal Declaration of Human Rights; American Convention on Human Rights (Pact of San José); Convention on the Protection of Human Rights and Fundamental Freedoms; Convention relating to the Status of Refugees; Protocol on the Status of Refugees; International Convention on the Elimination of All Forms of Racial Discrimination; Convention against Torture and Other Cruel, Inhuman or Degrading Treatment and Punishment; Inter-American Convention to Prevent and Punish Torture; Inter-American Convention on the Forced Disappearance of Persons; International Convention for the Protection of All Persons from Enforced Disappearance; International Covenant on Civil and Political Rights; Declaration of the Rights of the Child; Convention on the Elimination of All Forms of Discrimination against Women; Judgment delivered by the Inter-American Court of Human Rights on November 24, 2010, in the judgment of the historic case of Araguaia; Jurisprudence of the Inter-American Court; and the presentation of activities carried out by the Forces in Peace Missions (BRASIL, 2011c, p. 3).

Therefore, the set of actions aimed at symbolic memory, associated with the practice established in the curricula represented an important step towards the integration proposed by the Army Teaching Law (BRASIL, 1999).

> Art. 3 The Army Education System is fundamentally based on the following principles:
>
> I – integration into national education;
>
> [...]
>
> VI – constant improvement of ethical, moral, cultural and efficiency standards. (BRASIL, 1999, n.p, author's emphasis).

According to the results obtained, the impact of these measures was felt, even before the effective implementation of the Military Professional Ethics course, in 2015. In an interview with officers who were cadets at the time of the negotiations, there was a change in terminologies considered traditional, "socially accepted" within AMAN. The first replacement was the designation of the first-year cadet: "animal", considered a pejorative term associated with an irrational animal or the legitimizing discursive instrument for the application of prank calls by

cadets of other years, was gradually replaced from 2008 on by the terms "*basicante*" or "first year". It is important to highlight that there was a gradual awareness campaign not to treat the subordinate with humiliating words or indicators of racial discrimination, as reported by an officer[32] trained by the Academy:

> An example of this is in the treatment of "animal" and "big nigga", right (sic); people called black cadets "nigga" [...] Ah, "big nigga", come here! [...] And then, so much that the name of the target of the Shooting Section (for rifle and pistol exercises) was changed, right? Today it is no longer: ah! I gave so many shots at the "big nigga". Today the target name is "A2" (alpha two), which is the larger black target (for 9mm caliber pistol shots) (C3, 2019).

When the principles of the END and the legal framework that supports the curricular structure are analyzed, the coincidence between the measures taken at the political level aligned with the gradual action at the tactical level within the military schools. The modification was supported with signs already existing and consecrated in the military environment. Despite not having found any document that forbids the use of such words, the instructors' verbal guidelines from 2008 onwards linked the change to the main idea of "treating subordinates with kindness" and "treating weapon-brothers with affection", contained in the oath to the national flag, a commitment solemnly signed by all soldiers associated with "reciprocal respect among people/work mates".

As stated by Alberti (2013), in methodological terms, it is necessary to understand these reports as a contribution to political oral history, previously academically devalued, but which provide the institution with a broader understanding of human action and its relations with society. Another idea used to force the change was to link the pejorative terms to the practice of bullying, a concept now widespread in the school environment in Elementary (1st to 9th grade) and Middle (1st to 3rd grade) education[33]. Thus, a relationship of continuity was established in the cadets who were entering the military education system. In parallel, the instructor officers were verbally instructed by the Cadet Corps in adopting the new treatment. An officer, who had been a cadet representative of the AMAN Command, described the experience related to the topic in direct conversations with the general:

32 The names were changed to preserve the identity of the interviewees, who signed the Free and Informed Consent Term (FICT).

33 The word "bullying" is universally understood as a set of aggressive, repetitive and intentional behaviors for no apparent reason, adopted by one or more students against another (A) causing anguish, pain or suffering. Bullying was initially researched by Dan Olweus in Norway from 1978, when cases of systematic physical and psychological aggression committed by generally older students within the school system were verified. Cases of suicide among young people have prompted laws around the world aimed at eliminating the practice. In Brazil, research has intensified since 2000, 40.5% of students admitted that they were directly involved in acts of bullying in 2002, with 16.9% identifying themselves as targets, 12.7% as authors and 10.9% authors and targets (ABRAPIA, 2002).

> The general always showed a concern to listen to the cadet... of talking [...] yeah [...] he wanted to demonstrate, right? I don't know if there was a basis of truth... but I know there was, because I was his assistant, I saw him talking to people, asking for their opinion, sometimes I gave an opinion about something, in this sense of improving the life of the cadet... for his life to be less "low morale". When the general was commander of the Cadet Corps [...] for him, the cadet had to have a lot of self-denial... no one motivated him [...] it was just negative reinforcement (punishment), you know. Then, when he tried to change it there, he tried to put it (humane treatment) into practice. And more motivation, and... talking about the attributes and values at the graduations of the Cadet Corps, right, being quite eloquent, trying to motivate the cadets in shape (D4, 2020).

The benchmark exercised made it possible to identify opportunities for improvement during the adaptation process, correcting the attitudes verified as anachronistic to the process, such as, for example, the humane treatment between peers and subordinates. A recently graduated officer commented on the difference in communication between older officers (colonels and lieutenant colonels) and more modern officers (graduated after the year 2000):

> I usually heard the term "animal" from the colonels, from the lieutenant colonels, you know? In these terms, because it's the older people who really say them... people now, the officers, I've never heard anyone say that... very old officers, like calling "Ah, animal!" [...] no one says it anymore [...] just "*basicante*" or "first year" [...] it is actually "first year" their call (younger instructors) (D1, 2019).

In this way, the students' bodies, in the training process, are guided, in their conscious and unconscious plan - and this can have profound impacts on the rest of their career. Therefore, the institutional *ethos* reveals customs, modes of participation, social and private practices that design military life. Internalization configures a kind of "systematic determination" that takes place through selection mechanisms in which, on the one hand, general meanings appear in general contexts, at the individual level, and, on the other hand, generalizations of the variations of thoughts that are established in the social (ROSSI; ROSSI, 2012). This portrait provided by the analysis of military oral history reveals the sternum of the military, and is also imbued with a particular profile that is self-justifying. The *ethos*, therefore, lends itself to respect for established power (SCRUTON, 2015).

4 Final Considerations

The impacts generated from the adoption of practices aimed at non-war activities and the promotion of human rights evidenced the inter-institutional dialogue to change AMAN's school curriculum. The understanding that the formation of officers also involves preparation for actions beyond the war between national states contributed to the gradual legitimization of the discourse that the military is prepared for war and also for state actions of a strategic nature.

The changes occurred as the federal government increasingly demanded subsidiary actions from the Brazilian Army, being more present in the first half of the 1990s and in the first half of the 2010s, moments when Brazil was hosting events of worldwide proportion, such as the ECO-1992 meeting, the headquarters of the Confederations Cup and the Soccer World Cup (2013-2014), and the Rio de Janeiro Olympics and Paralympics (2016).

In parallel, the systematic training of the ground combatant was undergoing a transformation. In view of the preparation focused on the three aspects (cognitive, psychomotor and attitudinal), it was not enough for the cadet to have rusticity, that is, physical resistance in the face of adversities imposed by the professional curriculum. It was now necessary to prepare the young officer to be trained to work in complex environments, where synergy with civilians was, is, and will always be fundamental to the success of operations. Not that this did not happen in previous moments, such as in the Second World War, however, the political and social demands in military operations increased considerably after the redemocratization in Brazil.

Furthermore, some tensions between the rupture of teaching strategies and the continuity of traditions solidified over time were evidenced in the process of military socialization from the 1990s, added to the desirable effect on the young officer that occurred in the process and in the tactical employment after the training. The discourse of civil-military integration proposed by the Army Education Law was also observed, in which the institutional promotion of human rights helped to shape the desired profile of the new cadet, attentive to the differences between the oldest officers and the most modern instructors.

Finally, everyday details, which were previously seen as gestures of intimacy and relaxation by colonels and lieutenant colonels, began to receive new contours for majors, captains and lieutenants. The contemporary perspective of civil-military integration in the formation of the officer of the Military Education Line contributed to the collective exercise of gradual forgetting, with discreet orders and few written documents. Thus, the support of methodologies such as oral tradition, the facts experienced by thousands of trainees over three decades helps us to identify motivations for the gradual transformation materialized in the curricular structure and in military education.

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Cyberspace, Logistics and National Security Threats, Not Necessarily in that Order

Amenazas al Ciberespacio, Logística y Seguridad Nacional, No necesariamente en ese orden

Abstract: What is the relationship between cyber vulnerabilities, logistics and national security? Concerns about the potential exploitation of cyberspace vulnerabilities to cause logistical inefficiency in national security matters have lingered for nearly a quarter of a century. This article updates the landscape of this debate and extends the analysis to the reciprocal threats posed by these three areas. A descriptive methodology, based on case studies obtained from government sources, academic articles and news articles, is used to correlate cyberspace, logistics chains and national security threats. It is demonstrated that, in addition to common sense that the exploitation of existing cyber vulnerabilities at different levels of the increasing automation present in logistical systems presenting new threats that can disable military systems or civil infrastructures relevant to national security, there is a growing threat posed by the logistical complexity to cybernetic products and national security, as well as a 'weaponisation' of national security decisions of some countries that jeopardize supply chains, cybernetic or not, of other nations, with reflexes in the development of their defence capabilities.

Keywords: cyberspace; supply-chain management; strategic management.

Resumen: ¿Cuál es la relación entre las vulnerabilidades cibernéticas, la logística y la seguridad nacionalxxxx Preocupaciones sobre la posible explotación de las vulnerabilidades del ciberespacio para causar ineficiencia logística en asuntos de seguridad nacional han persistido durante casi un cuarto de siglo. Este artículo actualiza el panorama de este debate y amplía el análisis a las amenazas recíprocas que plantean estas tres áreas. Se utiliza una metodología descriptiva, basada en estudios de casos de fuentes gubernamentales, artículos académicos y artículos periodísticos, para correlacionar el ciberespacio, las cadenas logísticas y la seguridad nacional. Se muestra que, además del sentido común de que los ciberataques pueden explotar vulnerabilidades existentes en diferentes niveles de la creciente automatización presente en los sistemas logísticos, presentando nuevas amenazas que pueden inhabilitar sistemas militares o infraestructuras civiles relevantes para la seguridad nacional, existe una amenaza creciente planteada por la complejidad logística a los productos cibernéticos y a la seguridad nacional, así como una 'armamentización' (*weaponisation*) de las decisiones de seguridad nacional de algunos países que ponen en peligro las cadenas de suministro, cibernéticas o no, de otras naciones con repercusiones en el desarrollo de sus capacidades de defensa.

Palabras clave: ciberespacio; gestión de las cadenas de suministro; gestión estratégica.

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1 Introduction

It is already common sense that the exploitation of cyber vulnerabilities can disable or severely damage critical logistical systems and, thus, jeopardize national security. However, would this be the only causality order between these variables? This article argues that it is not. As it will show, empirical evidence confirms that supply chains can be used to compromise cyber capabilities and impact national security. Likewise, it is shown that national security decisions of a country affect logistics chains that create cyber vulnerabilities. Therefore, under certain conditions, the three factors may be causally related in any order.

To achieve this, it uses a descriptive research method of the *associations'* type (GERRING, 2012). The method is applied using the lenses of Strategic Studies thinking, looking for recurrent patterns of effective force (not necessarily the military one) to overcome opposing wills in conflict situations. This approach pervades the works of Clausewitz (1976), Liddell Hart (1930, 1931), Aron (2002), Beaufre (1965), Howard (1979), Freedman (1998, 2015), Gray (2008) and Stone (2007), to cite a few. The selection of cases and reference documents comprehended the last 10 years, with the notable exception of Eligible Receiver, used as a hallmark of the problem devised.

The article is structured as follows. After this introduction, a second section presents a brief introduction to logistics, while a third one shortly describes its encounter with cyberspace. A fourth section poses two classic examples of cyberattacks that compromised defence systems, showing the traditional order of causality relationship among the three variables analysed. A fifth section exemplifies the risks of logistical incapacitation of military forces in the theatre of operations, both from the point of view of supplies and that of communication and control, exemplifying the case of cyberattacks threatening logistics and national security. A sixth section presents threats posed by software and hardware manufacturing processes, with a supply chain comprising several contact points exploitable for implementing vulnerabilities. This situation points to logistics threatening cybersecurity and national security, with a subsection discussing governments' efforts to deal with them. A seventh section discusses the 'weaponisation' of the cyber supply chain, where national security decisions threaten the logistics of cyber products. Finally, brief considerations are made about the findings of this work.

2 A (Very) Brief Introduction to Logistics

A well-accepted definition of business logistics presents it as "the process of planning, implementing, and controlling the efficient and effective flow and storage of goods, services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements" (WOOD, 1998).

The study of Logistics as a science originated in the military. Vegetius, in the IV or V century, already dedicated significant parts of his work to the basics of military supplies provision (VEGETIUS, 1767). Despite this, the term itself derives from *Major General de Logis*, a military staff member whose duty "formerly was to lodge and camp the troops, to give direction to the marches of columns, and to locate them upon the ground" (JOMINI, 1862, p. 188). Over the years, that basic set of functions has been extended with the increased complexity of armies and battles. Interestingly, Clausewitz, often considered the most influenceable western war theorist, neither gave a definition of logistics nor used a specific term to describe it. This lead academics to argue that he considered it "all that is required so that the fighting force can be taken as a given" (PROENÇA JÚNIOR, DUARTE, p. 645).

Currently, in the military sciences, Logistics refers to "all the activities of armed-force units in roles supporting combat units, including transport, supply, signal communication, medical aid, and the like" (LEIGHTON, 2022). The difficulty of finding a specific term that can, without prejudice, encompass and define precisely this elaborate list of activities still remains nowadays (LEIGHTON, 2022). The importance of logistics for the military is, indeed, expressed by the quote "amateurs talk tactics, but professionals talk logistics", "attributed to everyone from Napoleon Bonaparte to Omar Bradley" (EPSHTEIN; FAINT, 2019).

Supply chains are the flows of goods and information within and among organisations, "linked by a range of tangible and intangible facilitators, including relationships, processes, activities, and integrated information systems" (PECK, 2012, p. 196). They are "the mechanism at the heart of globalisation of the past few decades by which raw materials, parts and components are exchanged across multiple national boundaries before being incorporated into finished goods" (SUPPLY..., 2019).

The acquisition, storage, and distribution of hundreds of thousands of items of ammunition, armaments, vehicles (with their corresponding spare parts and maintenance services), fuel, uniforms, accommodation, food, health and hygiene, with complex supply chains, which must operate in difficult terrain, with restricted means of transport and in combat conditions, is a task of enormous complexity.

Fuel and armaments shall be stored in a combat zone with enough ammunition for defending it. Otherwise, the enemy could take those stocks of fuel and armaments, with a double negative impact: missing them and having them used against their original owners. Therefore, it is essential to have only the necessary and sufficient of each supply item in each area of operations. The same principles apply to civilian logistics: corporations seek to eliminate unnecessary stocks with the same effort with which they try to avoid the unavailability of items that could compromise their operations.

Despite operating in different scenarios, military and civilian logistics chains, thus, pursue the same primary objectives. Focus is no longer *mass-oriented*, but *velocity-oriented*, with only necessary and sufficient stocks, reliable distribution, adequate costs, reliable supply chains and *just-in-time* or *on-demand* delivery (KRESS, 2002).

3 Where Logistics and Cyber Meet

Effectiveness, the resulting combination of efficiency (doing things right) with efficacy (doing what needs to be done), is an imperative for logistics. As such, automation has been historically attached to supply chain management.

Modern logistics demands dynamic information about the entire supply chain, named 'In-Transit View' (KRESS, 2002). Such controls are strongly supported by computerised systems, whatever the form of contracting, cost control, inventory or distribution adopted. Data generated at scattered points, whether from claimants, suppliers or transporters, are collected and processed in an integrated manner in real-time. The user informs his position and need; the system checks the availability of suppliers and informs the price and estimated time of arrival (ETA) to the user, who may or may not confirm the order. If acceptance is established, the user can follow the item's movement towards him and the adjusted ETA in real-time.

Similarly, computerised systems allow to scale demand, determine the location and size of inventories, demand suppliers, sometimes even without human interaction, to control and monitor the distribution of items, and also to determine the change of plans operational, providing 'total asset visibility' (KRESS, 2002).

Autonomous vehicles, as well as artificial intelligence, "may fundamentally alter how supply chains operate and use their integrated data, systems and assets"; these new levels of automation shall increase efficiency and reduce operational costs (TURNBULL, 2018, p. 45). As a fundamental part of what is now called Industry 4.0, it is expected that Additive Manufacturing (3D printing) might make possible the local production of items and spare parts on demand, thus simplifying transportation and storage needs and associated risks. In 2015 the U.S. Army Engineer Research and Development Center Construction Engineering Research Laboratory established the Automated Construction of Expeditionary Structures (ACES). It aims to develop reliable user-friendly 3D printing technology capable of generating custom-designed military expeditionary structures on demand, in the field, using locally available materials (JAGODA *et al.*, 2020, p. 2). In January 2021, the U.S. DoD released its Department of Defense Additive Manufacturing Strategy to align 3D printing with the DoD mission (UNITED STATES, 2021a, p. 4). The U.S. military already can "print" replacement parts for submarines, Humvees and even B-52 strategic bombers, and ordered a shipping container-sized portable 3D manufacturing unit that could be deployed on land and sea (BURTON; MCBIRNEY, 2022; SCHWAAR, 2022).

Nonetheless, despite how vital the pros of increased automation are, they also carry relevant cons. With the push for automation, logistics systems will become increasingly connected and targetable (TURNBULL, 2018). Not surprisingly, the U.S. DoD report issued in 2022, in attention to the Executive Order on America's Supply Chains from 2021, makes 88 references to "cyber" terms, more than a third of the 251 references to "supply chain" (BIDEN JR, 2022; UNITED STATES, 2022a).

Technological advances raise the spectre of an arms race in supply-chain security, with private and state-sponsored hackers having the upper hand over corporations and governments (SUPPLY..., 2019). Moreover, supply chains are already one of the "three main vectors of cyberattack" (along with networks and human insiders) (NYE JR, 2017, p. 50). Hence, much effort is yet to be made to secure supply chains from attacks through computing devices (LEE; MOLTKE, 2019).

4 Cyberthreats to National Security Logistics Systems

This section presents the classic case of cyber threats risking logistics relevant to National Security.

Almost a quarter of a century ago, in June 1997, the U.S. Joint Chiefs of Staff carried out an exercise named *Eligible Receiver* to test American cyber defences. The proposed scenario was that of a crisis that would force Washington to quickly send troops and aircraft to South Korea. Thirty-five experts from National Security Agency (NSA) made up the 'red team', simulating hackers in the service of North Korea with the mission of subverting the American operation, using only publicly available equipment and information. In just two weeks, using only commercial computers and hacking programs downloaded from the Internet, this red team could "simultaneously break into the power grids of nine American cities and crack their 911 emergency systems" (ADAMS, 2001, p. 101).

"Having ensured civilian chaos and distracted Washington", hackers attacked the Pentagon's computer networks, becoming able to "roam freely across the networks, sowing destruction and distrust wherever they went" (ADAMS, 2001, p. 101). For example, directing supplies to wrong destinations, potentially crippling state-of-the-art combat aircraft due to a lack of fuel, spare parts and weapons (ADAMS, 2001).

Similarly, the exploitation of cyber vulnerabilities in military logistics could be behind the disabling of radar and computerised anti-aircraft batteries, as the Israelis arguably have done in Operation Orchard before embarking on an airstrike against Syria's alleged nuclear facilities in Deir Ez-Zor (LIFF, 2012).

Currently, the U.S. Defense Science Board (DSB) considers the impacts of a cyberattack against supply chains to be potentially spectacular. Whenever the U.S. is in conflict, it must wait for cyberattacks intending to corrupt its supply chains, make its missiles and bombs not work, or even use them against the American troops themselves. Supplies, including food, water, ammunition, and fuel, could not reach where or when needed. Military commanders would quickly lose confidence in information and the ability to control their systems and forces. Once lost, trust is arduous to recover (UNITED STATES, 2013b).

In 2013/14, the U.S. Senate Committee on Armed Services investigated cyberattacks involving the U.S. Department of Defense (DoD) Transport Command (TRANSCOM) and eleven of its suppliers. The resulting report notes that the committee focused on TRANSCOM due to its central role in 'mobilization, deployment, and sustainment oper-

ations and the critical capabilities that TRANSCOM contractors provide to meet military requirements in contingency operations' (BRYAN *et al.*, 2014). The report states that private airlines provide more than ninety per cent of the passenger handling capacity and more than a third of the DoD's gross cargo handling capacity, while 95% of its dry cargo is transported by merchant ships. In addition, more than 90% of DoD deployment and distribution transactions occur in non-classified networks, many of which belong to private companies, according to an estimate by the TRANSCOM commander (BRYAN *et al.*, 2014).

The TRANSCOM investigation identified 50 cyberattacks or intrusions carried out between June 1, 2012, and May 30, 2013. Also, at least 20 successful intrusions into contractor networks were classified as Advanced Persistent Threats (APT). The term is "used to distinguish sophisticated cyber threats that are frequently associated with foreign governments"; of these, the command was informed of only two, "a worrying finding, given the potential impact of cyberintrusions on defense information and operations" (BRYAN *et al.*, 2014, p. i).

Among the reasons why TRANSCOM was unaware of the attacks, it was found that there were gaps in the contractual communication requirements, in addition to the lack of a common understanding between the contractor and its contractors as to the scope of what should be reported regarding cyberattacks. Besides, the Federal Bureau of Investigations (FBI) and DoD were often unaware that companies identified as victims of cyberattacks were suppliers to that command (BRYAN *et al.*, 2014).

The U.S. Defense Logistics Agency (DLA) Strategic Planning 2015-2022 established that cybersecurity constitutes a significant operational risk that imposes severe challenges on DLA supply chains at all times. Thus, it is necessary to create an environment that stimulates reporting and combating cyber threats and that the same attention should be extended to its supplier base, where DLA must be 'astute' in relationship management to ensure that private sector partners protect supplies and the integrity of data to effectively provide support to combatants (UNITED STATES, 2015). The intended cunning may be reflected in using PBL to' stimulate' suppliers.

The U.S. Senate investigation found that all APTs identified in TRANSCOM and its suppliers were assigned to China. It also indicated that Chinese military analysts identified logistics and mobilisation as potential U.S. vulnerabilities, 'given the requirements for precision in coordination, transportation, communications, and logistics networks' and that Chinese military doctrine 'advocate[s] targeting adversary command and control and logistics networks to impact their ability to operate during the early stages of conflict'. Moreover, the investigation found that American experts in Chinese military planning raised the possibility of China using cyber capabilities to prevent the deployment of U.S. forces in the event of a contingency (BRYAN *et al.*, 2014). Thus, the Chinese could seek to obtain, in an eventual conflict with the USA, the same advantages obtained by the NSA red team in Eligible Receiver, 25 years ago.

Possibly the most relevant effect of Eligible Receiver was the fact that hackers were also able to paralyze the human Command and Control (C2) system with a high level of distrust stemming from a commanding General's false orders, forging "bogus news reports on the crisis and instructions from the civilian command authorities" (ADAMS, 2001, p. 101).

> "As a result, nobody in the chain of command, from the president on down, could believe anything. This group of hackers using publicly available resources was able to prevent the United States from waging war effectively" (ADAMS, 2001, p. 101).

C2 is also a military logistics function. Although non-intrinsically a cyber military capability as many others, it became so dependent on cyberspace that an opponent might be tempted to seek a first disabling cyberattack on them (MORGAN, 2010). This process of cyber-C2-degradation, aimed at destroying (or at least largely degrading) the opponent's internal cohesion, could potentially incapacitate the military forces of the targeted foe and increase the effectiveness of a subsequent kinetic attack against them.

Moreover, modern weaponry has been increasingly dependent on integrated circuits, and today electronics contain programmable code of increasing complexity. At the same time, DoD has become a much less influential buyer in a vast and globalized supplier base. Because of this, ensuring that electronic defence components are free of vulnerabilities is a Herculean task (UNITED STATES, 2017).

Since the configuration settings of these devices remain unchanged for long periods, compromised components can create persistent vulnerabilities, and exploiting these vulnerabilities in components or their embedded software can cause modern weaponry to fail. Such explorations are particularly harmful because it is difficult to differentiate them from electrical or mechanical failures.

Besides, a cyber-attack itself does not need to be lethal. If it degrades the effectiveness of a military force or reduces the functionality of precision weapons and targeting systems or the availability of fuel and medical supplies, the result will be deadly for the force-dependent on compromised resources (TURNBULL, 2018).

Still, in the realm of National Security, besides the cyber threats to military logistics and C2, there is also the often-mentioned cyber threat to civilian critical-infrastructure. Until recently, the most famous cases had been those involving the Ukraine power supply in 2015, named Industroyer, and 2016, named CrashOverride, arguably launched by Russian hackers (AUCHARD; FINKLE, 2016; ZETTER, 2016). However, in May 2021, a ransomware attack attributed to a Russian cybercriminal group named DarkSide, hit the Colonial Pipeline, leaving vast parts of the U.S. with restricted supplies of petrol derivates (SANGER; PERLROTH, 2021).

5 Logistical Threats to Cyber Products

This section discusses the case where logistics threaten cyber products and National Security. It is common sense that a screw, fuse or chemical component tampered with in a long and difficult to control supply chain can affect the performance of, or create physical vulnerabilities in, any military equipment. A less perceptible understanding, however, is that similarly, components tampered with in the extended supply chain of hardware or software products can affect the performance of or create vulnerabilities in them and the systems that use them. To better capture this concept, it is necessary to understand the cyber products' supply chain, which the U.S. National Institute of Standards and Technology (NIST) calls the Cyber Supply Chain (NIST; FIREEYE, 2015).

As early as 2001, American intelligence officials believed 'that certain equipment and software imported from Russia, China, Israel, India and France' were infected with 'devices' capable of 'reading data and destroying systems', although this suspicion was difficult to prove (ADAMS, 2001). Recently, counterfeit hardware was identified in systems acquired by DoD (LYNN III, 2010). As a result, a report by the U.S. House Permanent Intelligence Commission in 2012 restricted the purchase of equipment from Chinese companies Huawei and ZTE (ROGERS; RUPPERSBERGER, 2012).

Current digital systems are highly complex, built by overlapping software and hardware components integrated into different levels and provided by various suppliers from diverse parts of the world. The materiality of hardware makes it easily perceivable, and humans are more prone to understand and accept it as risky or unsafe. Nevertheless, software is what 'animates' hardware.

At the very basic software level, electronic devices are usually controlled by *firmware*, software recorded on their components. It determines how the equipment operates. A famous example is the Basic Input Output System (BIOS) of processors, but it also exists on network and video circuit boards, scanners, or printers. Increasingly, hardware offers the possibility of updating its firmware, thus changing the device's operational behaviour without needing to replace it. Malware can exploit firmware vulnerabilities, for example, by inserting a kill switch that could deactivate the hardware under enemies' orders. Possibly worse, malware can make devices behave erratically.

The firmware uses another software layer, the *driver*, to communicate with *Operating Systems* (OS) like Android, iOS, Windows or Linux. The same hardware-firmware pair (a printer, for instance) has different drivers to communicate with different OS. A tampered driver can modify how a device operates, deceiving the OS. This was the principle behind Stuxnet, where the Programming Logic Controllers (PLCs) connecting the Iranian uranium enrichment centrifuges to their Supervisory Control And Data Acquisition (SCADA) system were replaced by tweaked ones. Hence, while the control system indicated the centrifuges were regularly operating, they were actually spinning out of pace and thus being physically damaged (ZETTER, 2015a).

At a higher level, it is possible to contaminate the OS itself. In the Snowden case, it was revealed that Cisco, the world's largest manufacturer of network assets, had its routers and servers' OS (Cisco IOS) manipulated by the NSA (GREENWALD, 2014). In December 2015, Juniper Networks, the second-largest manufacturer of network assets, announced the discovery of a secret backdoor in JunOS, the OS of its firewalls. It was found that it had been inserted into the code before 2011 (ZETTER, 2015b). It did not become clear who would have implanted that backdoor.

In August 2016, Cisco, again, announced the discovery of a 0-day (factory) vulnerability in Cisco IOS, implanted 13 years before, that could be exploited to ensure full access to networks using their equipment. It was found when analysing program-code allegedly belonging to the Equation Group (hackers linked to the NSA) that was 'leaked' on the Internet by hackers group Shadow Brokers (GOODIN, 2016). Hence, the NSA could have exploited this vulnerability to breach computer networks of U.S. interest. Cisco found at least eight other similar backdoors in its OS in 2017 and 2018 (CIMPANU, 2018; CISCO, 2017).

The following software level is called *middleware*, the "software that lies between an operating system and the applications running on it", "[e]ssentially functioning as hidden translation layer", and enabling communication and data management for applications (MICROSOFT, 2022). This category includes database and web servers, among others. Applications (Apps) connect to them thru software libraries called Application Programming Interfaces (APIs) or Software Development Kits (SDKs). These APIs, which are often developed by third-party suppliers in different parts of the world, can be tweaked in the integration process.

Almost at the top software layer is the Commercial-Off-The-Shelf (COTS) software, like office automation platforms, e-mail systems, pdf generators and readers, and hundreds of others. Weaponised Adobe Portable Document Files (PDFs) and Microsoft Office documents have been compromising systems for a while (HUTCHINS; AMIN; CLOPPERT, 2010).

Finally, the top software layer is that of specialised applications, which run the 'core businesses' of organisations, such as logistics systems. The complexity of modern applications has turned software development into assembly, in a context of collaborative development, with very specialized components (APIs) acquired from third parties, thus creating very long supply chains (SHERMAN, 2019).

Much of these components are *black boxes*, with their source code invisible, although Open-Source Software (OSS) is gaining space in the software industry and acceptance within the military (UNITED STATES, 2021b). The software supply chain has become a complex web of components within an organisation's trusted downloaded components of code used to build applications (BLESSMAN, 2019). Furthermore, software is 'extremely malleable under pressure from the right combination of finger strokes, which can bring both strategic advantages and weaknesses when embedded in the world through dependence on connected technology' (WOODS; BOCHMAN, 2018).

Overall, this complexity makes it crucial to keep these multiple components up-to-date, and ongoing software patch management is necessary. The management of software patching is complicated by the fragility of production environments where a multitude of applications and supporting packages must interact without causing conflicts or catastrophic failure (TURNBULL, 2018).

Moreover, a tweaked version of software of a Ukrainian accounting firm containing a destructive payload, named NotPetya, paralyzed networks globally, costing FedEx and Maersk, two logistic giants, more than $300 million each (UNITED STATES, 2018). Software update mechanisms (delivery systems, indeed!) were abused to gain access to grid control systems (WOODS; BOCHMAN, 2018).

In another famous case, in 2017, circa 2.2 million customers were infected with a backdoor when hackers, targeting companies like Samsung, Sony, Asus, Intel, VMWare, O2 and Fujitsu, hijacked the automated update system of CCleaner, an anti-virus and security software (CORERA, 2018; UNITED STATES, 2018).

Recently, investigations revealed that SolarWinds, a U.S. company that produces an IT network management software named Orion, had been infected as early as October 2019. The compromise of that supply chain allowed the use of Orion's routine software security update to install malicious software in SolarWinds customers' networks. This compromise ensured the hackers' access to at least nine U.S. federal agencies, including the Department of Treasury and the Department of Justice, and to "major digital-technology outfits such as Cisco, Intel, Nvidia and Microsoft, as well as cyber-security companies like FireEye" (WILLETT, 2021, p. 8).

The software supply chain complexity challenges most corporate security programmes, since tampered components become hard to detect, and "organizations simply trust that their vendors are providing secure software, offering threat actors a workaround for defeating an organization's security procedures" (BLESSMAN, 2019, p. 10).

Vulnerabilities in the supply chain can be inserted or discovered over the entire life cycle of a software product, giving particular concern to the fact that most systems are developed, acquired, and distributed without formal protection plans (UNITED STATES, 2017).

5.1 Dealing with the Cyber Supply Chain

The 2011 DoD Strategy for Operating in Cyberspace posed supply chain vulnerabilities and threats to DoD's operational ability as one of the 'central aspects of the cyber threat' (UNITED STATES, 2011). It also states:

> Software and hardware are at risk of malicious tampering even before they are integrated into an operational system. The majority of information technology products used in the United States are manufactured and assembled overseas. The reliance of DoD on foreign manufacturing and development creates challenges in managing risk at points of design, manufacture, service, distribution, and disposal (UNITED STATES, 2011, p. 3).

Intuitively, one might feel tempted to propose that the government should approve foreign hardware and software before they enter the market. In practice, however, this would not be viable. The number of lines of source code (SLOC) for commercial software products has grown to approximately fifty million, and the U.S. government believes this growth will continue for the next decades (UNITED STATES, 2013b). On the hardware side, complex integrated circuits today have more than two million transistors. It is, therefore, impossible to thoroughly test the flaws and vulnerabilities of such software or hardware products. Trying to check them fully would take years.

These complex products often enter the market with bugs. For example, in 1994, just after the brand new Pentium processors entered the market, a bug in its floating-point number division, making it considerable imprecise, was unveiled (HALFHILL, 1995). Again, in 2020, a new flaw was discovered in all of the company's processors produced in the last five years that could be explored to gain access to the system security (BLUMENTHAL, 2020).

In 2014, NIST published its Framework for Improving Critical Infrastructure Cybersecurity in a partnership between the U.S. government and the private sector, bearing in mind that 'similar to financial and reputational risk, cybersecurity risk affects a company's bottom line' (NIST, 2014). The central principle is that cybersecurity in the supply chain is not just about information and communication technology (ICT) but involves suppliers, resellers, management, supply chain continuity and reliability, transport security and other security activities.

Based on its framework, NIST started to research not only ICT companies but also companies that use ICT products widely in their processes. Among the participating companies are Boeing, Cisco, Deere, Dupont, Fire Eye, Fujitsu, Intel, Juniper, Northrop Grumman, P&G and utilities (or infrastructure) companies. The objective was to detect how companies deal with issues like the ones below (NIST, 2014):

- Third-party suppliers with physical or virtual access to information systems, source codes of programs or equipment (from cleaning to software engineering);
- Inadequate information security practices by its suppliers;
- Compromised hardware or software products purchased from suppliers;

- Software security vulnerabilities in supply chain management or supplier systems;
- Counterfeit hardware or embedded malware;
- Data storage or data aggregation by third parties;
- Repeatability and traceability of the software or hardware design and development process;
- Supplier's capabilities to address vulnerabilities, including 0-day.

Hence, there is a growing concern of the U.S. government regarding the guarantee of Cyber Supply Chain Risk Management (C-SCRM) with its suppliers, and these with theirs, recursively (NIST; FIREEYE, 2015).

When a government purchases products or services with inadequate *factory* or *built-in* security, risks persist throughout the life cycle of the purchased item. This long-lasting effect is part of what makes changing procurement processes so important to achieve cybersecurity and resilience. Buying products and services with the appropriate built-in 'factory' security may have higher upfront costs. Still, it reduces the total cost of ownership (TCO) due to risk mitigation and the reduced need to correct vulnerabilities in products distributed or deployed in the field (UNITED STATES, 2013a).

In typically long DoD procurement processes, about 70% of electronics in weapon systems are obsolete or out of production before these products are deployed (UNITED STATES, 2017). This causes new components to be inserted during the production process, which makes validating the integrity of these components even more difficult.

As a result, malware can be deployed to computer systems (hardware + software) as they are developed or built and potentially used to create remotely operated kill-switches and backdoors, allowing intruders to manipulate the systems running on it in conflict situations. To contain this risk, private software and hardware companies in the United States have become governmental partners in creating security mechanisms. For example, Microsoft and other computer companies develop sophisticated strategies to detect malicious code (such as the back doors of Juniper Networks and Cisco) and prevent its deployment in their global supply chains (LYNN, 2010). Despite, in March 2021, a failure in Microsoft's e-mail server product Exchange was used by Chinese hackers to gain access to users' data and e-mails, affecting 'up to 30,000 public and private entities, mainly small businesses and local governments' (WILLETT, 2021).

6 National Security Weaponisation of the Cyber Supply Chain

At last, this section describes how National Security decisions regarding export and import restrictions weaponize cyber supply chains, posing threats to the cyber logistics chain of other countries. This exemplifies the third case studied, where National Security decisions affect cyberspace and logistics chains in foreign countries.

Since 2015 the U.S. government has prevented Intel from reselling its most modern processors to China, allegedly because they would be used for nuclear tests (CLARK, 2015). In 2018, the country regained the top two positions on the supercomputer list, previously occupied by China (TOP500.ORG, 2020). The difference among the processors is reflected in the numbers shown. While U.S. Sierra, in the first place, reaches 200 PFLOPS with 2.4 million cores and consumes 10 MW of energy power, the Chinese TaihuLight, third in the list, using Chinese processors, reaches 125 PFLOPS with 10.6 million cores and consumes 15 MW (TOP500.ORG, 2020).

The preferred Chinese solution, typical of any developing country, is replacing foreign solutions with indigenous ones, a solution that requires a strong innovation capability and, counterintuitively, global connections (LEWIS, 2018). China uses "national champions, protects them in the domestic market, and helps them compete" globally (LEWIS, 2018, p. 5-6). "[I]f China had not blocked Google, there would be no Baidu" (LEWIS, 2018, p. 5-6). However, "[t]his promotion of national champions by any means is the source for much of the current trade tensions, and Western governments are slowly developing responses that will constrain China's growth unless its policies change" (LEWIS, 2018, p. 5-6)

More than 25 centuries ago, Sun Tzu wrote:

> If you know the enemy and know yourself, you need not fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know neither the enemy nor yourself, you will succumb in every battle (TZU, 2009, p. 13).

Having intelligence information is part of statecraft common sense. Furthermore, intelligence agencies are always looking for opportunities of gathering sensitive information thru ICT networks and devices, even in peacetime, and related to traditional partners and allies. Not even equipment provided by companies from traditionally neutral countries can be considered unsuspected and unreachable by their tentacles. For example, Swiss company Crypto AG, a manufacturer of cryptographers used in more than 120 countries, belonged, between 1970 and 2018, to a highly secretive partnership between the CIA and the German intelligence service BND. Crypto AG equipment was sabotaged so that those agencies could access the information those devices encrypted (MILLER, 2020). In another famous case, Snowden left clear that the NSA was spying on dozens of U.S. allies, including Germany, Brazil, Japan and Mexico (GREENWALD, 2014).

Now, the U.S. government accuses Huawei, the world leader in 5G telephony, of having obscure connections with Chinese intelligence. Moreover, the U.S. argues that it prefers the use of equipment from Swedish Ericsson or Finnish Nokia, even if more expensive, and personalities of the U.S. government have even suggested the acquisition of shares for controlling these companies (KHARPAL, 2020).

The United States is also pressuring its allies to veto the use of Chinese 5G technology. In May 2020, the United Kingdom announced a ban on the company from acting. The German Deutsche Telekom (32% state-owned) answered that excluding Huawei from their 5G networks would be 'Armageddon', and although not restricting its participation, recently announced that Ericsson was chosen (ALLEVEN, 2020; ERICSSON, 2020; PETZINGER, 2020). Under enormous pressure from the U.S. regarding the participation of Huawei in Brazilian networks, with the U.S. ambassador threatening 'consequences', the Brazilian military reportedly told their government that "the same eventual exposure that Brazil may suffer from Chinese technology with Huawei will also occur with any other company" (AMADO *et al.*, 2020; ROSA; ANTUNES, 2020). Indeed, a very pragmatic position, considering the Crypto AG, Cisco and Juniper cases, among others.

On the Chinese side, in 2017, a new cybersecurity law restricted the sale of foreign information and communication technology. In addition, China demanded that foreign companies submit these products to government-administered National Security reviews, and that firms operating in China store their data in China, requiring official approval before being transferred to other countries (UNITED STATES, 2018). As it is clear that security reviews shall be long and imperfect, this seems to be a way of creating barriers for foreign technology, a counterstrike due to Huawei's western restrictions.

Excluded from the U.S. market in 2019, Huawei responded by banning the use of North American components. The Chinese giant began to work to replace these components with Chinese versions (STRUMPF, 2020). However, even that strategy was threatened when the U.S. Department of Commerce stepped up in May 2020 and banned component manufacturers using U.S. technology worldwide from selling products to Huawei (UNITED STATES, 2020). This new difficulty can even take the company out of its dominant position in the 5G race and jeopardize the maintenance of telephone networks of other generations provided by the company and already in use in several countries (STRUMPF, 2020). In addition, the U.S. is now considering blocking the supply of U.S. technology to five Chinese video surveillance companies (SHIDONG, 2019).

Restrictions on use do not only refer to hardware, but also software. The U.S. government's ban on Huawei prevents Google from licensing the use of Android OS on company phones (MOON, 2019). Although Android's core is open source, so it can continue to be used by the Chinese company, several associated services are provided by Google and would no longer be available, limiting the usefulness of Huawei's smartphones (MOON, 2019).

Amidst the U.S. embargo on supplying technology to China, Beijing has ordered all government offices and public institutions to remove foreign equipment and software by 2022 (YANG; LIU, 2019). The move is part of a campaign to reduce Chinese dependence on foreign technologies, is likely to decouple supply chains between the U.S. and China, and could mean a significant blow to U.S. companies (YANG; LIU, 2019). The new sanctions imposed added urgency to the project. Unlike previous efforts for self-sufficiency in technology, the goal is that companies and the government will soon be free from threats (YANG; LIU, 2019).

Nonetheless, replacing U.S. hardware and software with Chinese equivalents also poses problems. China's Lenovo uses processors made by Intel and hard drives made by South Korean Samsung (YANG; LIU, 2019). China lags behind the U.S. in some of the most advanced technologies, including chip design and manufacturing. Intel and Qualcomm manufacture the main components of some of the country's largest technology companies. The OS most used on devices produced in China is Google Android, on smartphones and tablets, or Microsoft Windows, on computers (SHIDONG, 2019).

In 2019, the U.S. elevated the tone with the Executive Order on Securing the Information and Communications Technology and Services Supply Chain, which states:

> Unrestricted acquisition or use in the United States of information and communications technology or services designed, developed, manufactured, or supplied by persons owned by, controlled by, or subject to the jurisdiction or direction of foreign adversaries augments the ability of foreign adversaries to create and exploit vulnerabilities in information and communications technology or services, with potentially catastrophic effects, and thereby constitutes an unusual and extraordinary threat to the national security, foreign policy, and economy of the United States (TRUMP, 2019, n. p.).

Then, in 2020, the U.S.-China clash gained a new chapter, involving the TikTok App, used for posting short videos, controlled by Chinese-owned company ByteDance, allegedly posing threats to National Security. It is not yet clear what would be those threats, but it is important to observe that National Security relevant information can be obtained from unsuspected sources. In 2018, data from a harmless fitness tracking app called Strava revealed the location of U.S. Army secret bases worldwide. The company released maps that would identify 'popular running routes in major cities, or spot individuals in more remote areas who have unusual exercise patterns'. Nevertheless, "military analysts noticed that the map is also detailed enough that it potentially gives away extremely sensitive information about a subset of Strava users: military personnel on active service" (HERN, 2020).

Whatever the reason, in the Tik Tok case, the U.S. government intended to force its local operation to be sold to an American-owned company. The legal support is provided by the Committee on Foreign Investment in the United States (CFIUS) under the Defense Production Act of 1950 (UNITED STATES, [2022b]). CFIUS can block the acquisition of American companies by foreign investors. In 2018, TikTok, then named Music.ly, also a Chinese company, was bought by ByteDnce. But Music.ly, despite being Chinese, under CFIUS regulations, is considered 'U.S. business' as an entity that engages in interstate commerce in the United States. Thus, CFIUS can force the U.S. operation to an American-owned company since ByteDance has not asked for CFIUS approval at the time of the acquisition (CHESNEY, 2020).

7 Conclusion

This article sought to demonstrate how Cyberspace, Logistics, and National Security pose severe threats one to the other. Not necessarily in the usual perceivable order of causality, but in any chosen order. A prolific set of dozens of cases, involving majorly cyber powers such as the United States and China, as well as the United Kingdom, Germany and other nations' governments and private companies, has provided robust empirical evidence to sustain this argument.

First, it has shown how the demand for better logistics leads to increasing automation, thus for more computerised logistics support. This crescent automation, along with the use of increased digital communications, autonomous vehicles, artificial intelligence and additive manufacturing (3D printing), among other new technologies, poses growing risks of exploiting cyber vulnerabilities and allowing for the logistical incapacitation of military forces and societies. Hence they present many opportunities for compromising National Security. Since 2018, there has been an increased pace of measures taken (or initiated) by the governments of cyber powers aimed at reducing this risk. Nevertheless, as argued by this piece, this was the classic and more common-sense perception.

Second, much less evident than the first one, the article showed how increasingly complex logistics pose risks to the reliability and performance of hardware and software products. As shown, in a similar way that a tweaked electro-mechanical component infiltrated anywhere in the extensive supply chain of a military equipment, maliciously altered software or hardware components can compromise its reliability or performance. Hence, it also affects National Security. To achieve this, it presented the concept of cyber supply chains, and how its complexity transcends national borders, demanding much research and investments to create and maintain controls that increase the security of these products, while fluid enough not to make their development too rigid and time demanding. A concrete fact that complicates this control is that hardware and software production chain is highly complex, with many points of contact distributed in different parts of the world. Exemplifying,

computers made in Brazil can simultaneously have circuits and chips designed in the USA, Germany and Japan, and produced in China, Taiwan, Singapore, Vietnam and India, whose firmware was produced in many other countries. Likewise, the large and complex modern software systems are also built in development centres spread over several countries by technicians from other countries.

Third, it was also demonstrated how National Security based decisions, such as the restriction of exporting (or importing) IT components to or from foreign countries, can compromise either hardware and software supply chains (logistics) and the pace of the development of cyberspace. Not only in those nations that are their primary targets, but also in those who implement these measures. As explained, substituting foreign-provided components with indigenous (or 'neutral' third party) ones, if not a Herculean task as the control of the cyber supply chain, is also an expensive and time-demanding effort.

Overall, the article shows that the perception has evolved from a static threat, closed within the perimeter of the nation, government or defence production, to a dynamic danger present throughout the entire supply chain, notably private suppliers.

The bad news is that securing all three areas is a very complex task. Moreover, its feasibility still requires much research, particularly concerning high-tech assets in the Defence Industrial Base, the companies that supply governments with products and services related to National Security.

The good news is that huge efforts have already been made on the subject at the international level, with abundant material available, which allows us to save time and resources to implement several practices adopted by the world-class industry. More importantly, there is an increasing perception that the subject needs to be treated accordingly to its relevance.

For now, the only certainty is that global supply chains related to cyberspace and National Security will be under much more scrutiny than they are nowadays. Furthermore, a considerably larger nationalistic approach can be expected, possibly (or probably) profoundly changing what has been considered the core of recent globalisation tendency.

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ECEME

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For a seat at the high table! Economic expression of National Power as an influencing factor for the reform of the United Nations Security Council

¡Por un asiento en la alta mesa! La expresión económica del poder nacional como factor influyente para la reforma del Consejo de Seguridad de las Naciones Unidas

Abstract: This paper aims to compare the Economic Expression of National Power of permanent member countries and of potential candidates to occupy a seat, integrating the respective Regional Groups, as an influencing factor for the reform of the Security Council. The sample consisted of 55 countries, which were divided into groups: Permanent and Regional Members (African, Asia-Pacific, Eastern Europe, Latin America and the Caribbean and Western Europe and others). The Economic Expression was analyzed according to the indicators: National Material Capacities, Contribution to the regular budget of the United Nations and Gross Domestic Product. In order to verify the equality or difference between the mean values of the groups, the *One Way* ANOVA test was used and, sequentially, the Levene and Tukey tests. A significant difference was found between the groups, with the Permanent Members Group having higher average values, however, individually, candidate countries have economic indices similar to the permanent members, which may influence the perspective of Security Council reform.

Keywords: Security Council; United Nations; national power; economic expression.

Resumen: Este trabajo tiene como objetivo comparar la Expresión Económica del Poder Nacional de los países miembros permanentes y potenciales candidatos a ocupar un escaño, integrando los respectivos Grupos Regionales, como factor de influencia para la reforma del Consejo de Seguridad. La muestra estuvo compuesta por 55 países, que se dividieron en grupos: Miembros Permanentes y Regionales (África, Asia-Pacífico, Europa Oriental, América Latina y el Caribe y Europa Occidental y otros). Se analizó la Expresión Económica según los indicadores: Capacidades Materiales Nacionales, Contribución al presupuesto ordinario de las Naciones Unidas y Producto Interno Bruto. Para verificar la igualdad o diferencia entre los valores medios de los grupos se utilizó la prueba ANOVA *One Way* y, secuencialmente, las pruebas de Levene y Tukey. Se encontró una diferencia significativa entre los grupos, con el Grupo de Miembros Permanentes teniendo valores promedio más altos, sin embargo, individualmente, los países candidatos tienen índices económicos similares a los miembros permanentes, lo que puede influir en la perspectiva de la reforma del Consejo de Seguridad.

Palabras clave: Consejo de Seguridad; Organización de las Naciones Unidas; poder nacional; expresión económica.

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1 Introduction

The new global realities have exponentially increased economic conflict, bringing to light a set of non-military threats that could increasingly put at risk the security of a state. From this understanding, the economic component becomes a protagonist, in the context of globalization and strong economic integration, as a fundamental aspect for the projection and sovereignty of a state (VERÍSSIMO, 2005).

Keohane (1988), when addressing hegemony in the World Political Economy, questions the deterministic view of the theory of hegemonic stability, which was based only on the realistic concepts of interests and power. To be considered hegemonic, a country should have access to essential raw materials, control major sources of capital, sustain a large import market, and hold comparative advantages in high-value-added goods that produce relatively high benefits and wages. It should also be stronger, on those dimensions taken globally, than any other country. Within this scope, as commented and facing the previous assertion, the evolution of the global economy brought with it, from the end of the last century, the appearance of emerging markets (BRADFORD, 2003). Middle-income developing countries have achieved above-average growth rates in order to integrate into the world economy through trade and finance, promoting transformation in the economy to make it multipolar.

Reinforcing these findings, César & Sato (2012) state that international trade has undergone profound transformations in recent years. In turn, Bonaglia and Goldstein (2007) make reference to the existence of a new geography of international trade linked to the rapid advance of globalization of productive processes through global value chains.

Te Velde and Keane (2011) add the idea that it is unlikely that new forms of cooperative relations in relation to global economic governance will evolve unless the structures, objectives and norms of these institutions are better aligned with the preferences of emerging powers.

In addition, Souto Maior (2003) postulates that in the economic area, the contemporary scenario does not present a hegemonic power, but a group of developed countries that seek to actively promote their interests in those sectors in which they are more competitive and protect other fields, at the expense of consumers themselves and producers in developing countries.

Strong currents expect that the poles, until then existing in Europe and North America, will lose relative military and economic power, challenging Western values and culture domination (COX, 2007; IKENBERRY, 2001; ZAKARIA, 2008). In addition, the protagonist role of emerging powers in the world economy and global governance, after bipolarity, has been discussed under the labels of great powers (HURRELL, 2006), uncertain powers (MAULL, 2006), emerging powers, intermediate powers and pivotal states (CHASE *et al.*, 1996; FLEMES, 2007; HAKIM, 2004; LIMA; HIRST, 2006; SCHOEMAN, 2003) and new Titans, and these countries are now widely perceived in international relations.

In this new world order, Schirm (2010) points out that in the past decade, policy makers, the media and academic research have increased discussions about the new role of emerging powers in the world economy and global governance. It states that countries such as Brazil, China, India and South Africa, as well as Germany, Japan and Russia have stood out and increased their influences in the economic and political spheres, regionally and in world politics.

Observing this new international socio-economic landscape and questioning global representativeness, Weiss & Thakur (2010) posit that economic governance is the most advanced and comprehensive dimension of emerging global governance. For them, in the security sector there is a still growing gap, between the distribution of authority within existing international institutions and the international distribution of economic power.

Arraes (2005), considering the economic aspect as the most relevant for inclusion to the position of permanent member in the United Nations Security Council (UNSC), states that two natural candidates have emerged in the current international panorama, Japan and Germany. He adds that both suffered, paradoxically, the greater defeat in the Second World War and are not significant exporters of military material to peripheral countries or nuclear powers. Considering the possibility that the international system moves towards the expansion of representation in its main organizations, Third World countries could claim presence with the most important segment of the United Nations. Thus, it points out that when balancing a set of factors, Brazil, India, Egypt, Nigeria, South Africa, Mexico, among others, emerge as potential candidates for a permanent seat in the UNSC.

As justification for reforms, in particular an expansion in the UNSC, Albright and Gambari (THE HAGUE INSTITUTE FOR GLOBAL JUSTICE; STIMSON CENTER, 2015) point out that the present international architecture is characterized by a hyperconnected global economy, added to the fragility of states, in the face of violent conflicts, which should be adapted with the inclusion of other global players.

From the founding of the UN until 1965, the council was composed of eleven members, the five permanent ones (China, USA, France, United Kingdom and Russia), with veto power (blocking any collective decision, even if unanimously by other countries) and another six rotating non-permanent members (FONTOURA, 2013). The body underwent a single reform that year, on which occasion four new non-permanent seats were created, whose terms were fixed at two years (without the possibility of immediate re-election), changing the number of members from eleven to the current fifteen. Despite the change, the composition and structure remained portraying the post-World War II context, with the greatest victors of the contest as permanent members.

Among other issues, this controversial issue of UNSC reform gained traction in 2005, when the then Secretary-General, Kofi Annan, presented a five-year report on the implementation of the 2000 Millennium Declaration (UNITED NATIONS, 2000), which had been requested by the United Nations General Assembly. Among other themes, the

document reflected the view, enshrined by the majority, that a change in the composition of the council was necessary to make it more representative of the international community as a whole, as well as geopolitical realities, and thus more legitimate in the eyes of the world (UNITED NATIONS, 2005).

Signaling the possibility of further reform, in 2008 The General Assembly unanimously approved the convening of intergovernmental negotiations to expand the Security Council, which continue indefinitely to this day.

Within the scope of the UN, Member States are unofficially divided into five groups of geopolitical regions (UNITED NATIONS, 2022), namely: African Group (with 54 Member States) and Asia-Pacific Group (54), each with three seats on the UNSC (considering the China permanent one); Eastern European Group (23) and Latin American and Caribbean Group (33), with two seats each (including the Russia permanent one); and Western Europe and others (29), with five seats (including the United States, France and the United Kingdom). The founders of the United Nations system believed that by dividing into Regional Groups, they would be providing a fair and reasonable opportunity for all members to share in the management of the system through periodic elections to key decision-making bodies, including the Security Council. Regional Groups can constitute elements of pressure at the UN, in particular in the case of questioning the legitimacy of the UNSC, where there is a lack of adequate representation of developing countries, especially from Latin America and Africa.

Regarding these power relations, one of the classic concepts that covers it in interpersonal relationships, but that can be easily extrapolated to relations between states, is the one defined by Robert Dahl (1957). In this, the author assumes that power can be measured, compared and scaled, resulting in mutual influences exerted between the actors.

Thus, National Power, defined as the capacity of the set of men and means that constitute the nation to achieve and maintain national objectives, in accordance with the national will (ESCOLA SUPERIOR de GUERRA, 2009b), is composed of the political, economic, psychosocial, military and scientific-technological expressions. Detailing the understanding of the economic expression, on which it is intended to shed light, it is established as the manifestation of a predominantly economic nature of National Power, which contributes to achieving and maintaining national objectives (ESCOLA SUPERIOR DE GUERRA, 2009a).

Thus, in the scenario of an eventual reform of the UNSC, from which a state actor has as a national objective the occupation of a permanent seat in such body, it is hypothesized that, the more developed the economic expression of the National Power of a state, integrating the respective Regional Group, the greater the possibilities of influencing said reform and aspiring to the effective occupation of a permanent seat.

2 Objective

This discussion aims to compare the economic expression of National Power of permanent member countries and potential candidates for seat, integrating the respective Regional Groups, as a factor of influence for the reform of the Security Council.

3 Methodology

This research presents quantitative evaluation methods. The comparative examination allows the empirical verification of the hypothesis regarding the approximation or remoteness of indicators of the economic expression of National Power of the possible candidates and permanent members of the UNSC, providing generalizations and assisting in the final production of a theory. For this purpose, the Comparative Policy method was used, interested in the development of comparative practice itself and in expanding the scope of explanations related to the topic.

To define the constituent countries of the sample, the criterion of temporal delimitation is presented, that is, the period in which the phenomenon to be studied will be circumscribed (GIL, 2002).

The methodology used to calculate the sample size, as well as for the definition of the sample are detailed in the work of Cunha (2020). Regarding the first, it was reached the number of 55 elements (countries) to be studied. Sequentially, in order to fill the defined sample, three or more participations of a state as a non-permanent member, in any period, or a minimum of two participations, with a mandate starting from 1990, also, excluding the most recent entries, were considered as inclusion criteria to characterize the potential candidacy for the permanent seat in the UNSC.

A total of fifty countries were selected as potential candidates for the UNSC. In addition to these, the five permanent members of the UNSC participate in the study, which represent the basis of comparison, making up the sample of 55 countries.

In order to bring the Member States closer and facilitate inferences from common characteristics, the potential applicants to the UNSC were stratified into the respective UN Regional Groups (Table 1), divided as follows: Permanent Members Group – P5 (five members), African Group – AG (eleven members), Asia-Pacific Group – APG (nine members), Eastern European group – EEG (four members), Latin America and Caribbean Group – LACG (eleven members) and Western Europe and Others Group – WEOG (fifteen members).

Table 1 – Study sample according to Regional Groups of UN Member States

Permanent Members (P5)	African (GA 11)	Asia-Pacific (GAP 9)	Eastern Europe (GLE 4)	Latin America and the Caribbean (GALC 11)	Western Europe and others (GEO 15)
China USA France United Kingdom Russia	South Africa Algeria Egypt Gabon Ghana Morocco Nigeria Rwanda Tunisia Uganda Zambia	South Korea Philippines India Indonesia Japan Jordan Malaysia Pakistan Syria	Bulgaria Poland Romania Ukraine	Argentina Brazil Chile Colombia Costa Rica Cuba Ecuador Mexico Panama Peru Venezuela	Germany Australia Austria Belgium Canada Denmark Spain Netherlands Ireland Italy Norway New Zealand Portugal Sweden Turkey

Source: The authors (2022).

For a better visualization of the scope of the study, Table 1 was elaborated below. This one can verify, in percentage, gross quantitative and percentage of countries surveyed, by Regional Group.

Table 1– Gross and percentage values of the study by Regional Group

Regional Groups	African	Asia-Pacific	Eastern Europe	Latin America and the Caribbean	Western Europe and others	Total
Total UN	54	54	23	33	29	193
% UN	28	28	11,9	17,1	15	100
Study Sample	11	10*	5*	11	18*	55
% Study	20	18,2	9,1	20,0	32,8	100
% representative	20,37	18,52	21,74	33,33	62,1	28,5

Source: The authors (2022).

Note: * included the permanent member in the UNSC.

The sample size of 55 countries corresponds to 28.5% of the total UN Member States and 46.2% of the 124 states that have already participated in the UNSC. The most representative groups in the UN are the African and the Asia-Pacific, with 54 countries each, making up 56% of the UN member countries. The study totalled 21 countries, concentrating just under 40% of the sample. Given the inclusion criteria, the largest Regional Group in the sample is the Western Europe and others, with 18 of 55 countries. This value corresponds to 32.8% of the countries to be studied and 62.1% of the group itself.

The study variables are quantitative in nature. The independent is represented by the "economic expression of National Power", whose comparative criteria between the respective Regional Groups and countries followed those established by the ESG, contained in the three volumes of its basic Manual (Fundamental Elements, Specific Subjects and Method for Strategic Planning/ESG), in addition to being based on internationally recognized indicators, detailed in Table 2, presented below.

Thus, for the ESG (2009a), the fundamental characteristic of the economic expression of National Power consists in activating the predominantly economic means through which man seeks not only to satisfy vital needs, but also to meet the welfare requirements originated by the constant evolution of the intellectual capacity at his disposal, increasing his needs and, therefore, the demand for consumption of goods and services.

Table 2 – Operational definition of the independent variable "economic expression of National Power"

Variable	Proxy	Indicators	Measurement method
Economic Expression of National Power	Economic Development	National Material Capabilities	CINC Index v 5.0 (CORRELATES OF WAR, 2017)
		Contribution to the UN regular budget	Rate and gross amount of taxation
		Gross Domestic Product (GDP)	Size of national economies and annual growth rate

Source: The authors (2022).

"Participation in the UNSC" is presented as a dependent variable, operationalized by the fact that a country is a permanent member or has already participated as a non-permanent member of the Council, constituting, for the purpose of this research, as a candidate for the permanent seat, which can be illustrated as Table 3, below:

Table 3 – Operational definition of the dependent variable "UNSC participation"

Variable	Proxy	Indicators	Measurement method
UNSC participation	Global governance	Permanent member	P5
		Non-permanent member	Regional Groups

Source: The authors (2022).

4 Data analysis

The application *IBM SPSS Statistics* was used to perform descriptive and inferential statistics of the quantitative variables of the study.

Given the normality criteria, the sample was considered large (n>30), which allowed the use of parametric tests, with greater statistical robustness (HOGG; TANIS, 2010). For the comparison between the means of the groups, the analysis of variance (ANOVA *One-Way*), of each of the quantitative variables dependent on the single factor variable (sample group), in order to verify which means are equal.

The ANOVA is robust for deviations from normality, based on the data considered as symmetric.To test this hypothesis, the Levene test was used, for homogeneity of variance of populations.

In order to locate the differences between the groups, the Tukey test was used, through two by two comparison techniques through confidence intervals for the sample difference.

5 Results and discussion

Following are the results related to the economic expression of National Power, with regard to the indicators of *proxy* of Economic Development, in order to evaluate what was proposed in the objective of this study.

6 Capacidades materiales nacionales

In order to detail each of the indicators, it is initially commented on the National Material Capabilities, which for measurement and establishment of the international hierarchy in economic and conflict issues, makes use of the composite index of national capability (*Composite Index of National Capability* - CINC). This constitutes the most widely used parameter of national capability based on the average of total world percentages in six different components: military expenditure, military personnel, energy consumption, iron and steel production, urban population, and total population (SINGER; BREMER; STUCKEY, 1972).

More recent studies tend to use CINC scoring, which focuses on measures that are most Noteble to the perception of state power, in addition to GDP (CORRELATES OF WAR, 2017)[1].

Thus, each component is a percentage to be calculated with the dimension of the world total:

$$\text{RATIO} = \frac{\text{Country}}{\text{World}}$$

$$\text{CINC} = \frac{\text{TPR} + \text{UPR} + \text{ISPR} + \text{ECR} + \text{MER} + \text{MPR}}{6}$$

Where:
TPR = total population of country ratio
UPR = urban population of country ratio
ISPR = iron and steel production of country ratio
ECR = primary energy consumption ratio
MER = military expenditure ratio
MPR = military personnel ratio

The information, detailed by component factor of the CINC formula, is provided by each Member State of the respective Regional Group, whose data are presented below in table format.

Below is Table 4 for the Permanent Members Group:

Table 4 – Permanent Members Group Components of National Capability and Composite Index

Permanent Member Group							
Country	Iron and steel production (ton)	Primary Energy Consumption (million tonnes of coal equivalent)	Military Personnel (in millions)	Military Expenditure (in billions Us$)	Urban Population (in millions)	Total Population (in millions)	CINC
China	494.899	4.177	2,26	46,17	748,53	1.325	0,198578
USA	98.102	5.548	1,51	552,57	82,97	302	0,142149
France	19.250	713	0,26	60,66	11,86	62	0,018924
United Kingdom	14.317	684	0,19	63,26	55,26	61	0,021158
Russia	72.387	1.559	1,03	32,22	68,23	142	0,039274

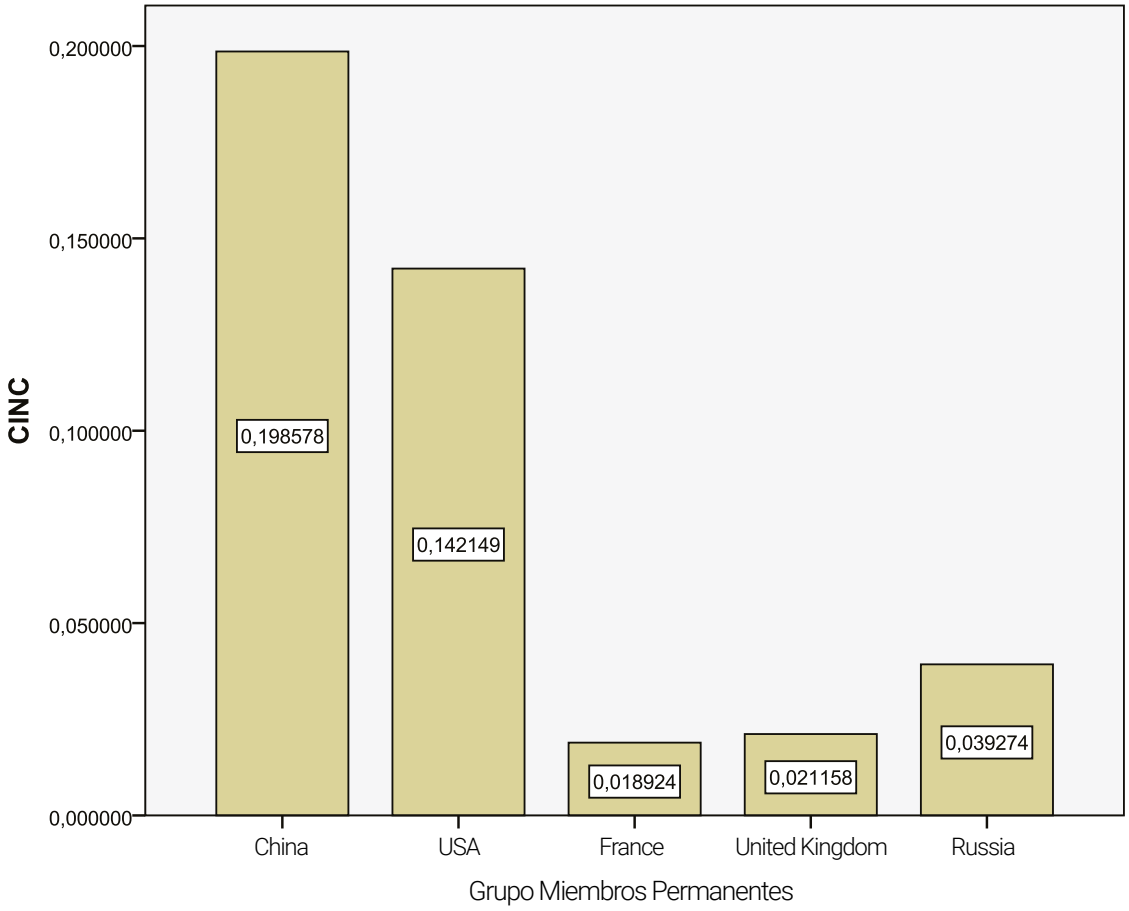
Source: adapted from Correlates of War (2017).

1 Data for CINC Index v 4.0 and 5.0 date back to 2007 and 2012, respectively.

From the observation of the total CINC values, it can be seen that China and the USA are the countries whose CINC values are the highest in the Permanent Members Group. The first probably influenced by population numbers and outstanding production of iron and steel, while the other, strongly linked to the values referring to their personnel and military spending.

For a better visualization of the results of the group members, Chart 1 is presented, in the sequence:

Chart 1 – National Material Capabilities of the Permanent Members Group



Source: The authors (2022).

For the African Group, the figures are shown in Table 5, below:

Table 5 – African Group Components of National Capability and Composite Index

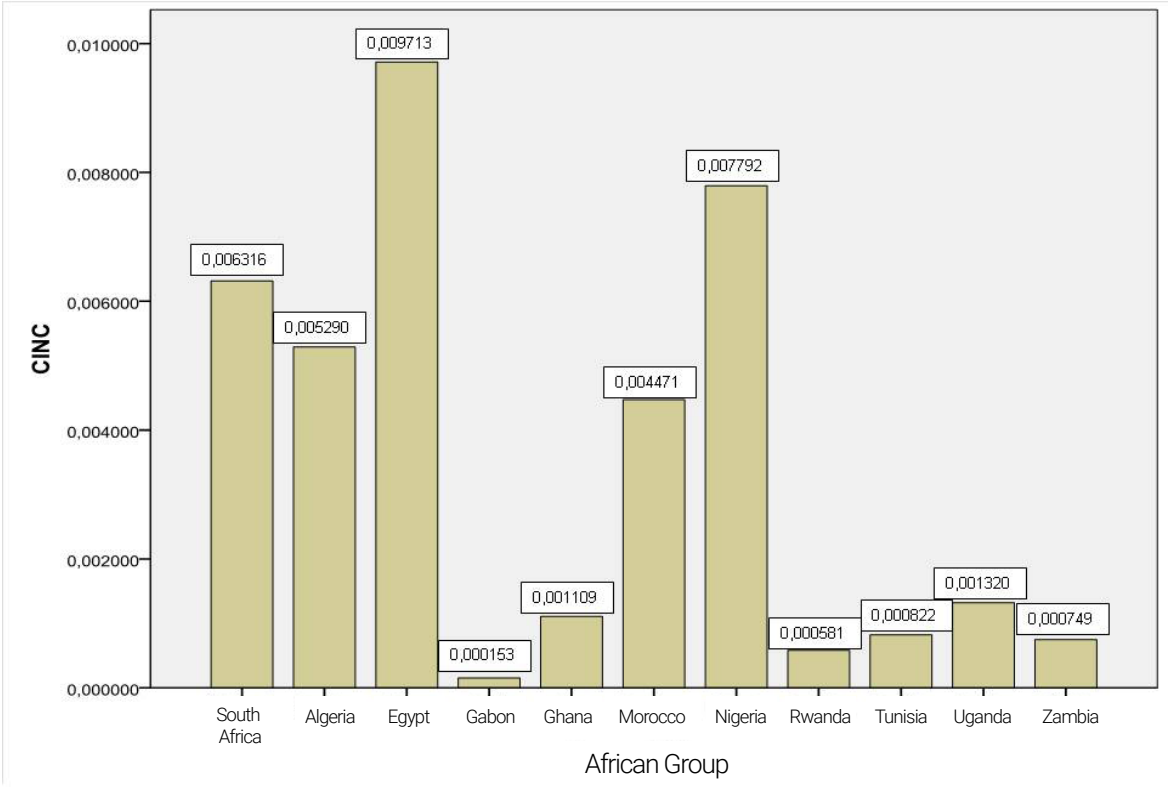
African Group							
Country	Iron and steel production (ton)	Primary Energy Consumption (million tonnes of coal equivalent)	Military Personnel (in millions)	Military Expenditure (in billions Us$)	Urban Population (in millions)	Total Population (in millions)	CINC
South Africa	9.098	326	0,062	3,75	15	48	0,006316
Algeria	1.278	306	0,138	4,27	11	34	0,005290
Egypt	6.224	129	0,469	4,64	30	77	0,009713
Gabon	0	3	0,005	0,123	0,58	1,3	0,000153
Ghana	25	13	0,014	0,104	4,5	22	0,001109
Morocco	512	31	0,201	2,41	19,4	31	0,004471
Nigeria	100	201	0,085	0,98	29,3	143	0,007792
Rwanda	0	3	0,033	0,062	0,52	9	0,000581
Tunisia	160	11	0,035	0,47	1,7	10	0,000822
Uganda	30	12	0,045	0,232	1,6	28	0,001320
Zambia	0	12	0,015	0,247	2,9	12	0,000749

Source: adapted from Correlates of War (2017).

In this, Egypt stands out, with the highest National Material Capability, which seems to be related to its highest effective and military spending. Followed by Nigeria, a country with a large total population, and South Africa, which has the largest iron and steel production and the highest primary energy consumption of the group.

Chart 2 shows the CINC values of each of the countries of the African Group.

Chart 2 – National Material Capabilities of the African Group



Source: The authors (2022).

The Asia-Pacific Group, made up of nine countries, has the National Material Capabilities set out below:

Table 6 – Asia-Pacific Group Components of National Capability and Composite Index

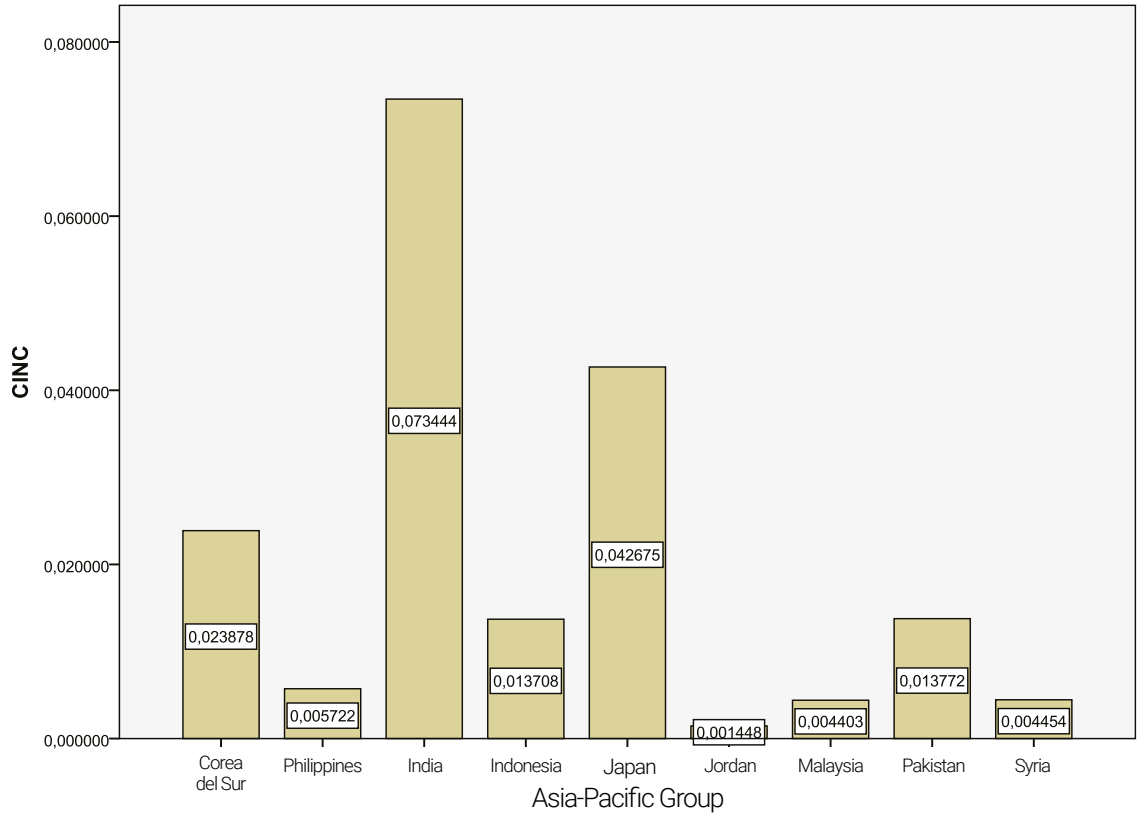
Asia-Pacific Group							
Country	Iron and steel production (ton)	Primary Energy Consumption (million tonnes of coal equivalent)	Military Personnel (in millions)	Military Expenditure (in billions Us$)	Urban Population (in millions)	Total Population (in millions)	CINC
South Korea	51.517	943	0,687	26,59	22,8	48	0,023878
Philippines	718	85	0,106	1,13	25,1	89	0,005722
India	53.080	1.573	1,32	26,51	198,1	1.134	0,073444
Indonesia	4.016	306	0,302	4,33	35,7	226	0,013708
Japan	120.203	1.935	0,24	41,04	84,4	128	0,042675
Jordan	150	11	0,101	1,62	2,2	5	0,001448
Malaysia	6.895	160	0,109	4,02	6,9	27	0,004403
Pakistan	1.090	134	0,62	4,53	40,9	160	0,013772
Syria	70	33	0,308	1,465	13,3	19	0,004454

Source: adapted from Correlates of War (2017).

The strong driving forces in the Asia-Pacific Group are India and Japan. The first is due to the significant indices in all components of the National Material Capability, with emphasis on its immense total population. Japan, in turn, due to its economic development, has the highest figures regarding iron and steel production and primary energy consumption. The South Korean indexes, although more modest, should also be highlighted, especially by high military spending, iron and steel production and primary energy consumption.

Countries can have their CINC values compared in the bar chart, which is shown below.

Chart 3 – Asia-Pacific Group National Material Capabilities



Source: The authors (2022).

The Eastern European Group, composed of four countries, has its National Material Capabilities data presented in Table 7.

Table 7 – Eastern European Group Components of National Capability and Composite Index

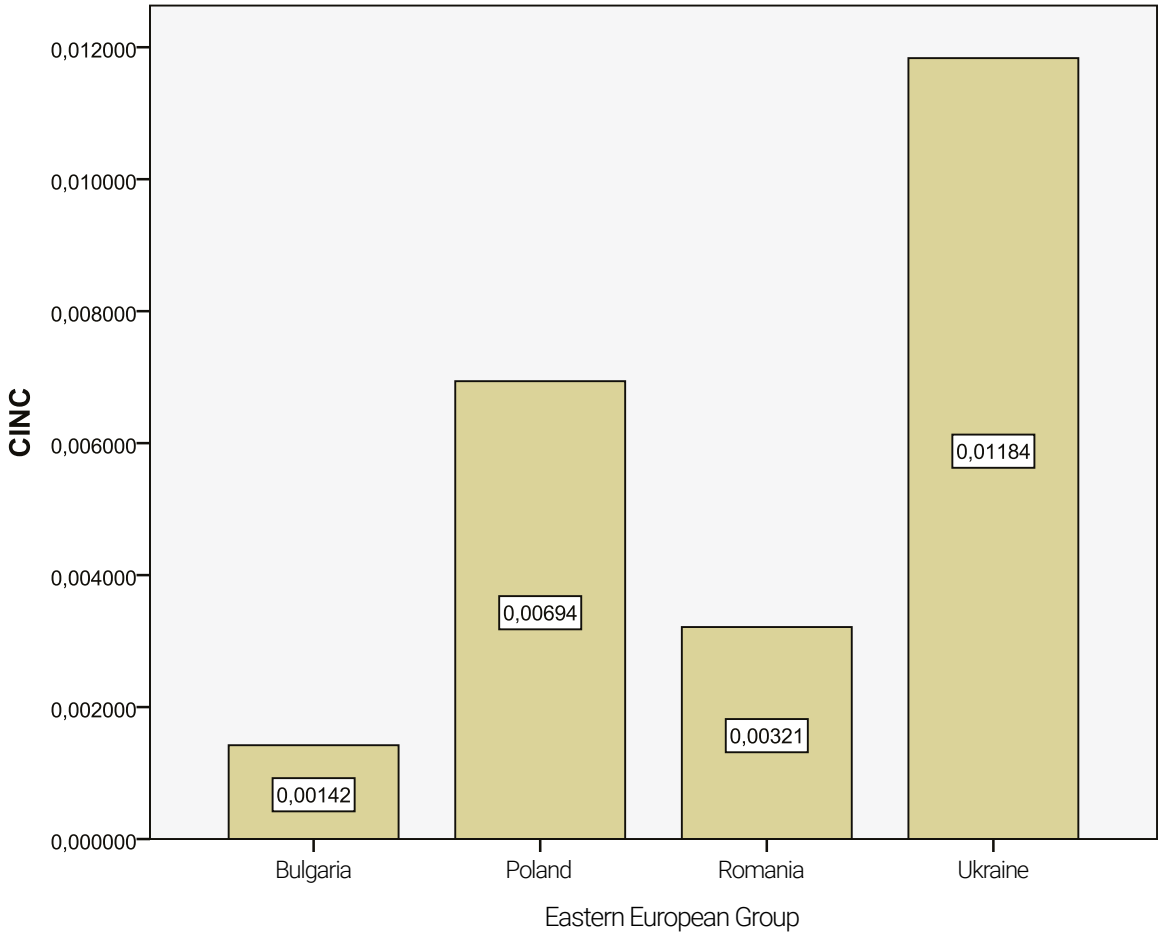
Eastern European Group							
Country	Iron and steel production (ton)	Primary Energy Consumption (million tonnes of coal equivalent)	Military Personnel (in millions)	Military Expenditure (in billions Us$)	Urban Population (in millions)	Total Population (in millions)	CINC
Bulgaria	1.909	47	0,051	0,881	2,4	8	0,001422
Poland	10.632	284	0,142	7,983	11	38	0,006939
Romania	6.261	76	0,070	3,044	6,4	22	0,003213
Ukraine	42.830	391	0,188	1,802	18	47	0,011835

Source: adapted from Correlates of War (2017).

In this, which is the smallest of the study groups, Ukraine reveals itself as the country with the most substantial levels of CINC, being the most populous in relation to the other members and holding the highest values of iron and steel production and primary energy consumption.

Details of the Eastern European group can be seen bellow in Chart 4.

Chart 4 – Eastern European Group National Material Capabilities



Source: The authors (2022).

The following presents the National Material Capabilities of the Latin America and Caribbean Group, which comprises eleven countries.

Table 8 – Latin America and the Caribbean Group Components of National Capability and Composite Index

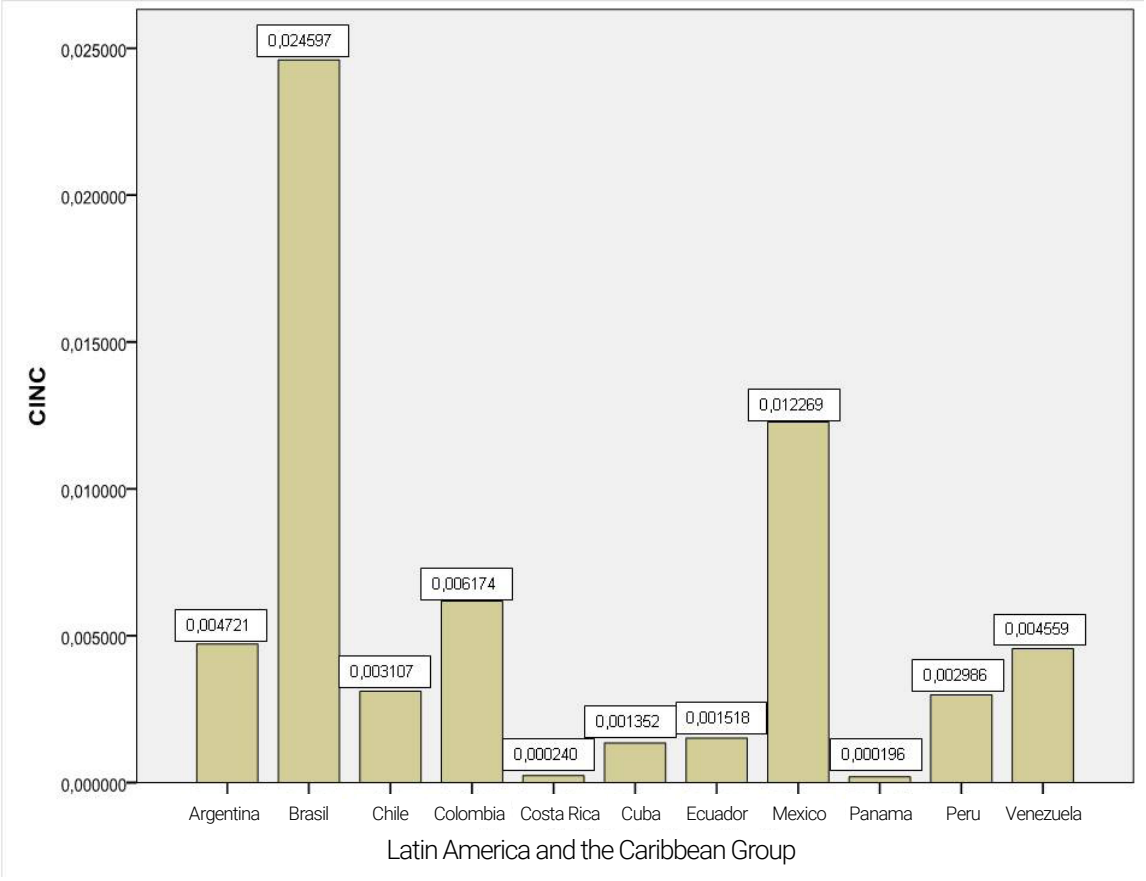
Latin America and the Caribbean Group							
Country	Iron and steel production (ton)	Primary Energy Consumption (million tonnes of coal equivalent)	Military Personnel (in millions)	Military Expenditure (in billions Us$)	Urban Population (in millions)	Total Population (in millions)	CINC
Argentina	5.387	146	0,072	2,09	18,2	39	0,004721
Brazil	33.782	511	0,29	20,56	103,3	188	0,024597
Chile	1.679	71	0,076	5,24	10,1	17	0,003107
Colombia	1.245	59	0,21	6,81	26	44	0,006174
Costa Rica	0	4	0	0,159	1,1	4	0,000240
Cuba	268	12	0,049	1,668	4,4	11	0,001352
Ecuador	87	20	0,057	0,773	6,3	14	0,001518
Mexico	17.573	300	0,238	3,982	43	106	0,012269
Panama	0	2	0	0,2	1	3	0,000196
Peru	881	37	0,08	1,226	15	28	0,002986
Venezuela	5.005	210	0,082	2,795	13,5	27	0,004559

Source: adapted from Correlates of War (2017).

In this group, Brazil is the country that holds the leadership in all sub-indicators of National Material Capabilities. It has the highest production of iron and steel, the highest consumption of primary energy, its personnel and military expenditures are the highest and the population, both urban and total, is the most representative of the analysis. Next, Mexico stands out with the second position in all the indicators commented.

The information is reaffirmed when looking at Chart 5, below:

Chart 5 – National Material Capabilities of Latin America and Caribbean Group



Source: The authors (2022).

The Western Europe and Others Group, the largest of the groups studied with fifteen members, has its data presented in Table 9, below.

Table 9 – Western Europe and others Group Components of National Capability and Composite Index

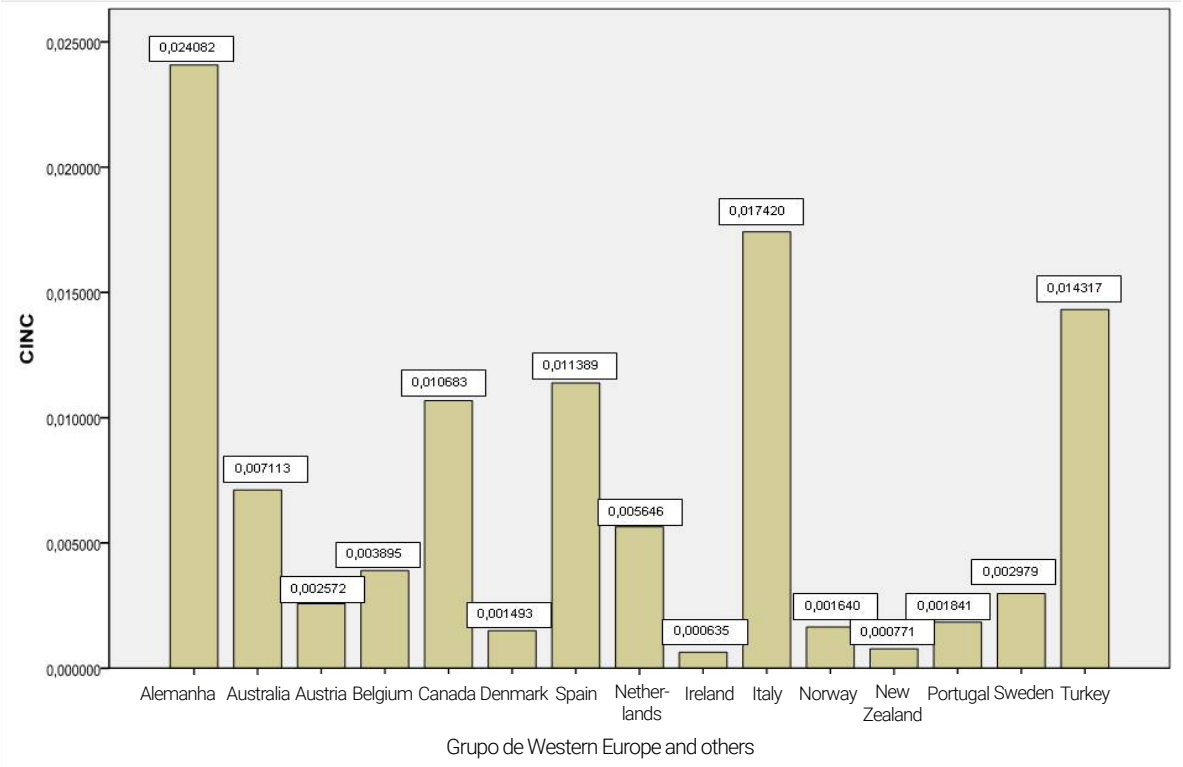
Grupo de Western Europe and others							
Country	Iron and steel production (ton)	Primary Energy Consumption (million tonnes of coal equivalent)	Military Personnel (in millions)	Military Expenditure (in billions Us$)	Urban Population (in millions)	Total Population (in millions)	CINC
Germany	48.550	1.158	0,25	42,11	25,34	82	0,024082
Australia	7.939	238	0,052	20,216	15,79	21	0,007113
Austria	7.578	78	0,040	3,603	2,4	8	0,002572
Belgium	10.692	213	0,040	5	1,5	11	0,003895
Canada	15.572	707	0,063	18,491	13,2	33	0,010683
Denmark	392	54	0,022	4,028	1,2	5	0,001493
Spain	18.999	529	0,147	17,495	18,8	45	0,011389
Netherlands	7.368	360	0,053	11,141	5,2	16	0,005646
Ireland	150	19	0,01	1,329	0,7	4	0,000635
Italy	31.553	790	0,19	37,77	13,61	59	0,017420
Norway	708	77	23	5,546	1,1	5	0,001640
New Zealand	845	24	0,009	1,388	2,2	4	0,000771
Portugal	1.400	92	0,044	3,389	0,9	11	0,001841
Sweden	5.673	129	0,028	6,773	2,6	9	0,002979
Turkey	25.754	370	0,515	13,643	14,2	74	0,014317

Source: adapted from Correlates of War (2017).

Regarding this group, Germany prevails with the most substantial values of National Material Capabilities. The country has the highest rates in almost all indicators, with the exception of military personnel, in which Turkey stands out. As a whole, Italy is in second place overall and in most of the indicators presented.

Again, the distribution of National material capacities can be seen in Chart 6, below

Chart 6 – Capacidades Materiales Nacionales del Grupo de Western Europe and others



Source: The authors (2022).

To understand the behavior of the studied groups, we present the descriptive statistics of the sample, composed of the respective means of the groups, standard deviations and maximum and minimum values of CINC, which can be completely analyzed in Table 2.

Table 2 – CINC descriptive statistics

Groups	n	Minimum	Maximum		S
Permanent Members	5	0,018924	0,198578	0,08401660	0,081691249
African	11	0,000153	0,009713	0,00348327	0,003376807
Asia-Pacific	9	0,001448	0,073444	0,02038933	0,023705092
Eastern Europe	4	0,001422	0,011835	0,00585225	0,004603154
Latin America and the Caribbean	11	0,000196	0,024597	0,00561082	0,007164043
Western Europe and others	15	0,000635	0,024082	0,00709840	0,007065209
Total	**55**				

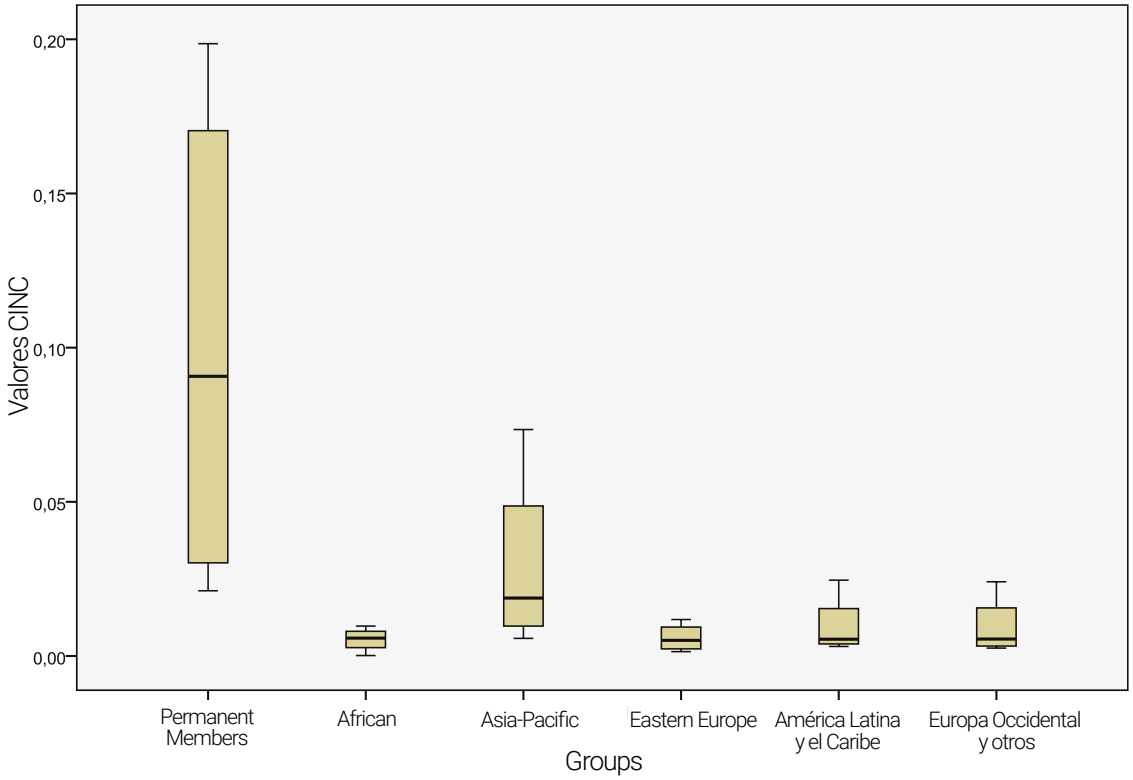
= sample mean Source: The authors (2022).

Caption: = sample mean; S = standard deviation

From the reading of this table, it can be seen that the Permanent Members Group has the highest average value of CINC (0,08401660), with the maximum value submitted by China (0.198578) and minimum of France (0.018924). The group that comes the closest, on average, to the permanent members is the Asia-Pacific Group (0.02038933), which includes India and Japan. The maximum value of the group consists of that of India (0.073444), while the minimum is that of Jordan (0.001448). Next, the Western Europe and others Group is indicated with an average of 0.00709840. Germany has the highest CINC value of the group (0.024082) and Ireland the lowest (0.000635). The next group is the Eastern European countries, whose average was 0.00585225. In this, the maximum value was presented by Ukraine (0.011835) and the minimum by Bulgaria (0.001422). With an average value slightly lower than the previous one, the Latin America and Caribbean Group is scored (0.00561082), which has Brazil at the forefront (0.024597) and, more modestly, Panama (0.000196). Finally, with the lowest average among the groups surveyed, the African (0.00348327) is noted, which presents as a maximum value that of Egypt (0.009713) and minimum that of Gabon (0,000153).

In Graph 7, the distribution of the means of the sample groups and the behavior of the quartiles can be compared using the box diagram (*blox plot*).

Chart 7 –*Box plot* National Material Capabilities



Source: The authors (2022).

From this analysis, it can be inferred that the Asia-Pacific Group is the closest to the Permanent Members Group. Moreover, it can be seen, from a more particular observation, that India, Japan, Brazil, Germany and South Korea stand out among the possible candidates for the UNSC permanent seat. India and Japan alone do not outperform China and the US, while the others perform higher than France and the UK. The figures obtained by Italy, Turkey, Pakistan, Indonesia and Mexico are also worth noting, revealing the economic prominence of these countries on the international scene, although with less expressive results than the permanent members.

In order to verify the equality or difference between the mean values of the groups, the ANOVA *One Way* was used, with 55 observations and 5 degrees of freedom. F (5.55) = 8.355 was found for a p-value of 0.000. Since the p-value is approximately zero, the null hypothesis of equality of means for any significance level is rejected. Thus, ANOVA allows us to conclude that the averages are not all the same, which means that there are significant differences in CINC values between Regional Groups and permanent members.

The Levene test was performed to verify the homogeneity of the variances, which confirmed the hypothesis. Table 3 shows the result of the Tukey test, from which the groups that presented different mean data were identified.

Table 3 – Tukey test for CINC indicator

			Difference from Means	Standard Error Lower Tail	Sig. Upper Tail	Confidence interval 95%	
P5		AG	,080533327*	,013907505	,000	,03929166	,12177500
		APG	,063627267*	,014382300	,001	,02097763	,10627690
		EEG	,078164350*	,017297241	,001	,02687067	,12945803
		LACG	,078405782*	,013907505	,000	,03716411	,11964745
		WEOG	,076918200*	,013315423	,000	,03743231	,11640409
AG		P5	-,080533327*	,013907505	,000	-,12177500	-,03929166
		APG	-,016906061	,011589588	,691	-,05127412	,01746200
		EEG	-,002368977	,015055316	1,000	-,04701439	,04227644
		LACG	-,002127545	,010994848	1,000	-,03473195	,03047686
		WEOG	-,003615127	,010235647	,999	-,03396817	,02673792
APG		P5	-,063627267*	,014382300	,001	-,10627690	-,02097763
		AG	,016906061	,011589588	,691	-,01746200	,05127412
		EEG	,014537083	,015494980	,935	-,03141212	,06048629
		LACG	,014778515	,011589588	,797	-,01958954	,04914657
		WEOG	,013290933	,010871997	,824	-,01894916	,04553103
EEG		P5	-,078164350*	,017297241	,001	-,12945803	-,02687067
		AG	,002368977	,015055316	1,000	-,04227644	,04701439
		APG	-,014537083	,015494980	,935	-,06048629	,03141212
		LACG	,000241432	,015055316	1,000	-,04440398	,04488685
		WEOG	-,001246150	,014510145	1,000	-,04427490	,04178260
LACG		P5	-,078405782*	,013907505	,000	-,11964745	-,03716411
		AG	,002127545	,010994848	1,000	-,03047686	,03473195
		APG	-,014778515	,011589588	,797	-,04914657	,01958954
		EEG	-,000241432	,015055316	1,000	-,04488685	,04440398
		WEOG	-,001487582	,010235647	1,000	-,03184063	,02886546
WEOG		P5	-,076918200*	,013315423	,000	-,11640409	-,03743231
		AG	,003615127	,010235647	,999	-,02673792	,03396817
		APG	-,013290933	,010871997	,824	-,04553103	,01894916
		EEG	,001246150	,014510145	1,000	-,04178260	,04427490
		LACG	,001487582	,010235647	1,000	-,02886546	,03184063

Source: The authors (2022).

Note: * the difference of the means is significant for level of 0.05.

From the reading of the previous table, it can be inferred that the average CINC of the Permanent Members Group is significantly different (higher) than the averages of the other regional groups, which, in turn, exhibit similar results in the light of statistics.

In short, regarding to the comparison of this first indicator, the superiority of the permanent members in relation to the other groups may consist in a possible obstacle to the negotiation to expand the UNSC, due to the more modest indices of CINC achieved by the Regional Groups, despite the prominent positions in the international scenario of some countries, when analyzed in isolation.

7 Contribution to the UN regular budget

Regarding this indicator, it is recalled that the UN is financed from voluntary contributions from its Member States. The budgets of the United Nations and its specialized agencies are evaluated every two years. The General Assembly approves the regular budget and determines the assessment for each member.

In accordance with resolution 73/271 (UNITED NATIONS, 2019a), the Assembly decided that the scale of contributions for the period 2019-2021 should be based on elements and criteria, taking into account: estimates of gross national income; the average statistical reference periods of three and six years; conversion rates based on market exchange rates, except for what would cause excessive fluctuations and distortions in result of some states, when exchange-price adjusted rates or other appropriate conversion rates should be employed, taking into account their resolution 46/221B (United Nations, 1991); the debt weight approach used in the contribution scale for the period 2016-2018; the adjustment for low per capita income of 80%, with a cap value of average per capita income of every Member States by statistical base periods; minimum tax rate of 0.001%; maximum tax rate for the least developed countries of 0.01%; and maximum tax rate of 22% (United Nations, 2020).

The contributions, including tax rates and gross value, are presented in the tables below, positioning the member state according to the global tax hierarchy (UNITED NATIONS, 2019b).

Table 10 – P5 Contribution to the UN regular budget, 2019-2021

Permanent Members Group			
Country	**Tax rate (%)**	**Gross value (in Us$)**	**World ranking**
USA	22	678.613.826	1º
China	12,005	370.307.226	2º
United Kingdom	4,567	140.874.061	5º
France	4,427	136.555.610	6º
Russia	2,405	74.184.830	10º
Σ	45,404	1.400.535.553	

Source: adapted from United Nations (2019b).

The Permanent Members Group concentrates part of the largest contributions to the regular UN budget , making up more than 45% of the total collected annually by the body. The US is the biggest contributor, reaching the top percentage rate of taxation of 22%, followed by China, just over half the rate. The United Kingdom and France are taxed at 4,5%, and Russia has a lower contribution, despite occupying 10° position in the contribution to the UN budget.

Table 11 below shows the information on the African Group:

Table 11 – African Group Contribution to the UN regular budget, 2019-2021

African Group			
Country	**Tax rate (%)**	**Gross value (in Us$)**	**World ranking**
South Africa	0,272	8.390.135	44º
Nigeria	0,250	7.711.521	46º
Egypt	0,186	5.737.372	50º
Algeria	0,138	4.256.760	54º
Morocco	0,055	1.696.535	68º
Tunisia	0,025	771.152	88º
Gabon	0,015	462.691	96º
Ghana	0,015	462.691	96º
Zambia	0,009	277.615	115º
Uganda	0,008	246.769	119º
Rwanda	0,003	92.538	146º
Σ	0,976	30.105.779	

Source: adapted from United Nations (2019b).

Naturally, according to the very rule established by the UN, in the face of the economic development of each Member States, countries from the African continent have lower contribution rates. In this Regional Group, South Africa is the largest contributor, with a tax rate of 0,272%, occupying only 44° World position. Together, the states that make up the African Group sample add up to less than 1% of the UN annual budget.

Details regarding the Asia Pacific Group are set out below:

Table 12 – Asia-Pacific Group Contribution of the to the UN regular budget, 2019-2021

Asia-Pacific Group			
Country	**Tax rate (%)**	**Gross value (in Us$)**	**World ranking**
Japan	8,564	264.165.855	3º
South Korea	2,267	69.928.070	11º
Índia	0,834	25.725.633	21º
Indonésia	0,543	16.749.423	29º
Malásia	0,341	10.518.514	38º
Philippines	0,205	6.323.447	48º
Paquistão	0,115	3.547.300	57º
Jordânia	0,021	647.768	90º
Síria	0,011	339.307	105º
Σ	12,901	397.945.317	

Source: adapted from United Nations (2019b).

This group turns out to be quite heterogeneous, since it encompasses countries such as Japan and South Korea, 3rd and 11th largest UN contributors, the former being taxed at 8.5%. However, it also covers countries with taxation below 0.1%, such as Jordan and Syria. The nine states that make up the Asia-Pacific Group sample are taxpayers with approximately 13% of the regular UN budget.

The contribution values for the regular budget of the UN, relating to the Eastern European group, are detailed in Table 13, below:

Table 13 – Eastern European Group Contribution to the UN regular budget, 2019-2021

Eastern European Group			
Country	**Tax rate (%)**	**Gross value (in Us$)**	**World ranking**
Poland	0,802	24.738.559	23º
Romania	0,198	6.107.525	49º
Ukraine	0,057	1.758.227	67º
Bulgaria	0,046	1.418.920	75º
Σ	1,103	34.023.231	

Source: adapted from United Nations (2019b).

From reading the information above, it can be seen that, despite the fact that Poland is the 23rd largest contributor to the UN, in general, the contribution rates of the countries of this group are intermediate, all less than 1%. Together, they make up just over 1% of the UN budget.

The Latin America and Caribbean Group can be further explored from the information presented below.

Table 14 – Latin America and Caribbean Group Contribution to the UN regular budget, 2019-2021

Latin America and the Caribbean Group			
Country	**Tax rate (%)**	**Gross value (in Us$)**	**World ranking**
Brazil	2,948	90.934.253	8º
México	1,292	39.853.139	16º
Argentina	0,915	28.224.166	19º
Venezuela	0,728	22.455.948	25º
Chile	0,407	12.554.356	33º
Colombia	0,288	8.883.672	42º
Peru	0,152	4.688.605	53º
Cuba	0,080	2.467.687	59º
Ecuador	0,080	2.467.687	59º
Costa Rica	0,062	1.912.457	66º
Panama	0,045	1.388.074	76º
Σ	6,997	215.830.044	

Source: adapted from United Nations (2019b).

Similar to the Asia-Pacific Group, Latin American and Caribbean countries show themselves to be quite heterogeneous when looking at contributions to the UN budget. Brazil and Mexico, 8th and 16th largest contributors, respectively, which together with the other members add up to almost 7% of the regular UN budget. However, the same group includes countries with a contribution of less than 0.1%, such as Cuba, Ecuador, Costa Rica and Panama.

A detailed reading of the rates and gross amounts of contribution to the UN for the Western Europe and others Group can be found below.

Table 15 – Western Europe and others Group Contribution to the UN regular budget, 2019-2021

Western Europe and others Group			
Country	**Tax rate (%)**	**Gross value (in Us$)**	**World ranking**
Germany	6,090	187.852.646	4º
Italy	3,307	102.007.997	7º
Canada	2,734	84.333.191	9º
Australia	2,210	68.169.844	12º
Spain	2,146	66.195.694	13º
Turkey	1,371	42.289.980	14º
Netherlands	1,356	41.827.289	15º
Sweden	0,906	27.946.551	20º
Belgium	0,821	25.324.634	22º
Norway	0,754	23.257.947	24º
Austria	0,677	20.882.798	26º
Denmark	0,554	17.088.730	28º
Ireland	0,371	11.443.897	35o
Portugal	0,350	10.796.129	37º
New Zealand	0,291	8.976.210	41º
Σ	23,938	738.393.537	

Source: adapted from United Nations (2019b).

In this group, as can be identified, some of the world largest economies are concentrated, a fact that justifies quite high contributions, such as those of Germany, Italy, Canada, Australia and Spain, all of which exceed 2%. The first country stands out, which is the fourth largest taxpayer in the world, with more than 6% taxation. The majority of the members are among the thirty largest contributors, revealing homogeneity of the group.

In order to provide a statistical understanding of the studied groups, regarding the indicator under study, Table 4 is presented, with the respective means, standard deviations and maximum and minimum values.

Table 4 – Descriptive statistics of Contribution to the UN regular budget

Groups	n	Minimum	Maximum		S
Permanent Members	5	2,405	22,00	9,08080	7,239547
African	11	0,003	0,272	0,08873	0,098986
Asia-Pacific	9	0,011	8,564	1,43344	2,606637
Eastern Europe	4	0,046	0,802	0,27575	0,309685
Latin America and the Caribbean	11	0,045	2,948	0,63609	0,829393
Western Europe and others	15	0,291	6,090	1,59587	1,498410
Total	55				

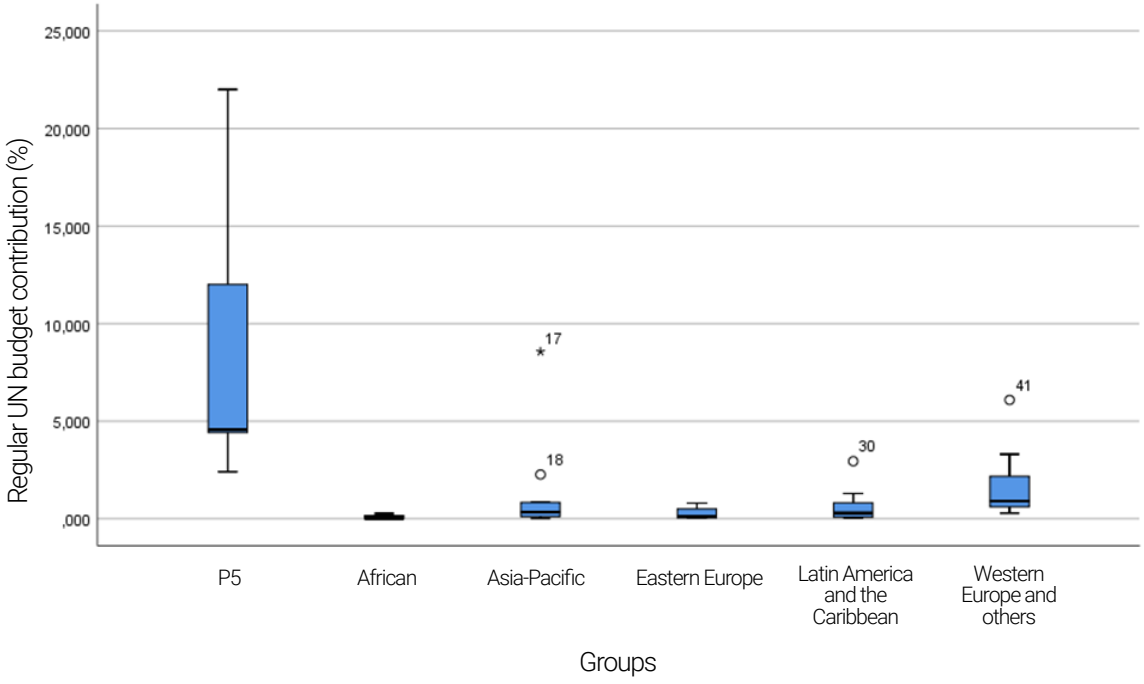
Source: The authors (2022).

Caption: = sample mean; S = standard deviation.

As can be seen in the table above, the Permanent Members Group has the highest average value of contribution to the UN budget (9,08080%), whose highest taxation is spent by the US (22%), as previously mentioned. The group that comes closest to the Permanent Members, on average, is the Western Europe and Others Group (1.59587%), which includes states with developed economies and, consequently, more taxed. The following is the Asia-Pacific Group with an average of 1.43344%, followed by other groups that already have contributions of less than 1% (Latin America and Caribbean Group - 0.63609%; Eastern European group - 0.27575% and African Group with an even lower average value, less than 0.1% - 0.08873%).

For better visualization, a box plot is presented in the graph below:

Chart 8 – *Box plot* of the contribution to the UN regular budget 2019-2021 (in%)



Source: The authors (2022).

Note: **Outliers*: 17- Japan; 18 - South Korea; 30 - Brazil; and 41- Germany.

Again, ANOVA One Way was used to test the equality or difference between the mean values of the groups, from 55 observations and 5 degrees of freedom. F (5.55) = 8.653 was found for a p-value of 0.000. Since the p-value is lower than 0.05, the null hypothesis of equality of means for any significance level is rejected. Thus, ANOVA allows us to conclude that the averages are not all the same, with significant differences in the amounts of contributions to the UN regular budget between Regional Groups and permanent members.

The Levene test was performed to verify the homogeneity of the variances, which confirmed the hypothesis. The result of the Tukey test is presented in the sequence, which exposes the groups that presented different mean data.

Table 5 – Tukey Test enter for the indicator contribution to the UN regular budget

		Difference from Means	Standard Error Lower Tail	Sig. Upper Tail	Confidence interval 95%	
P5	AG	8,992073*	1,471950	,000	4,62711	13,35703
	APG	7,647356*	1,522202	,000	3,13338	12,16133
	EEG	8,805050*	1,830715	,000	3,37620	14,23390
	LACG	8,444709*	1,471950	,000	4,07975	12,80967
	WEOG	7,484933*	1,409285	,000	3,30580	11,66406
AG	P5	-8,992073*	1,471950	,000	-13,35703	-4,62711
	APG	-1,344717	1,226625	,881	-4,98218	2,29275
	EEG	-,187023	1,593433	1,000	-4,91223	4,53818
	LACG	-,547364	1,163679	,997	-3,99817	2,90344
	WEOG	-1,507139	1,083326	,732	-4,71966	1,70538
APG	P5	-7,647356*	1,522202	,000	-12,16133	-3,13338
	AG	1,344717	1,226625	,881	-2,29275	4,98218
	EEG	1,157694	1,639966	,980	-3,70550	6,02089
	LACG	,797354	1,226625	,986	-2,84011	4,43482
	WEOG	-,162422	1,150676	1,000	-3,57467	3,24982
EEG	P5	-8,805050*	1,830715	,000	-14,23390	-3,37620
	AG	,187023	1,593433	1,000	-4,53818	4,91223
	APG	-1,157694	1,639966	,980	-6,02089	3,70550
	LACG	-,360341	1,593433	1,000	-5,08555	4,36487
	WEOG	-1,320117	1,535733	,954	-5,87422	3,23398
LACG	P5	-8,444709*	1,471950	,000	-12,80967	-4,07975
	AG	,547364	1,163679	,997	-2,90344	3,99817
	APG	-,797354	1,226625	,986	-4,43482	2,84011
	EEG	,360341	1,593433	1,000	-4,36487	5,08555
	WEOG	-,959776	1,083326	,948	-4,17230	2,25275
WEOG	P5	-7,484933*	1,409285	,000	-11,66406	-3,30580
	AG	1,507139	1,083326	,732	-1,70538	4,71966
	APG	,162422	1,150676	1,000	-3,24982	3,57467
	EEG	1,320117	1,535733	,954	-3,23398	5,87422
	LACG	,959776	1,083326	,948	-2,25275	4,17230

Source: The authors (2022).

Note: *The difference of the means is significant for level of 0.05.

Again, the Permanent Members Group had a significantly different mean than the averages of all Regional Groups, which showed no differences between themselves. Therefore, regarding the comparison of this second indicator, what was previously observed is repeated, with the superiority of the permanent members in relation to the other groups. In addition, the significant difference in the contribution to the UN budget, as an indicator of international economic projection, may represent an eventual obstacle to further develop negotiations regarding the reform of the UNSC, if sought by Regional Groups, as a means of pressure and influence, despite the high contributions of some of its members (as observed in the *outliers* states in their respective regional groups - Germany, Brazil, South Korea and Japan).

8 Gross Domestic Product

As a third indicator, GDP is studied, which represents the sum (in monetary values) of all final goods and services produced in a given region (whether countries, states or cities), during a given period. GDP is one of the most used indicators in macroeconomics with the aim of measuring the economic activity of a region.

In this research, the value of the nominal GDP of 2019 in dollars was used, available in the *World Economic Outlook Database of International Monetary Fund* (INTERNATIONAL MONETARY FUND, 2019) to measure national economies, as well as the comparison of annual growth rates (in percentages), presented in graphs of the *Data Mapper*, in the period 1980 to 2019 (with the exception of Egypt and Pakistan, whose data were used in 2018, due to the lack of more recent information; in addition to Syria and Cuba, which do not have GDP figures released for approximately ten years).

Table 16 below consolidates the GDP of the sample groups, as well as presents the world economy *ranking* of each of the states.

Table 16 – 2019 Nominal gross domestic product of sample groups

2019 Gross Domestic Product (in billion U.S. dollars)											
Permanent Members		African		Asia-Pacific		Eastern Europe		Latin America and the Caribbean		Western Europe and others	
USA	21439,45 (1º)	Nigeria	446,54(28º)	Japan	5154,47 (3º)	Poland	565,85 (22º)	Brazil	1847,02 (9º)	Alemanha	3863,34 (4º)
China	14140,16 (2º)	South Africa	358,83(37º)	India	2935,57 (5º)	Romenia	243,69 (48º)	Mexico	1274,17 (15º)	Itália	1988,63 (8º)
United Kingdom	2743,58 (6º)	Egypt	302,25(42º)	South Korea	1629,53 (12º)	Ukraine	150,40 (58º)	Argentina	445,46 (29º)	Canada	1730,91 (10º)
France	2707,07 (7º)	Algeria	178,63(55º)	Indonesia	1111,71 (16º)	Bulgaria	66,25 (75º)	Colombia	327,89 (40º)	Spain	1397,87 (13º)
Russia	1637,89 (11º)	Morocco	119,04(60º)	Malaysia	365,30 (35º)			Chile	294,23 (43º)	Australia	1376,25 (14º)
		Ghana	67,07 (74º)	Philippines	356,81 (38º)			Peru	228,98 (50º)	Netherlands	902,35 (17º)
		Tunisia	38,73 (95º)	Pakistan	284,21 (44º)			Ecuador	107,91 (61º)	Turkey	743,70 (19º)
		Uganda	30,66(102º)	Jordan	44,17 (92º)			Venezuela	70,14 (71º)	Sweden	528,92 (24º)
		Zambia	23,94(109º)	Syria	unavailable			Panama	68,53 (73º)	Belgium	517,60 (25º)
		Gabon	16,87(119º)					Costa Rica	61,02 (79º)	Austria	447,71 (27º)
		Rwanda	10,20(142º)					Cuba	unavailable	Norway	417,62 (30º)
										Ireland	384,94 (33º)
										Denmark	347,17 (39º)
										Portugal	236,40 (49º)
										New Zealand	204,67 (53º)

Source: Adapted from International Monetary Fund (2019)

It is noted that some participants of the Permanent Members Group are also part of G7 (USA, France and United Kingdom), the most industrialized and economically developed countries in the world, with the exception of China (second largest world economy, still classified as an emerging market and developing economy by the IMF, a G20 and BRICS member) and Russia (also a part of G20 and BRICS), the latter excluded from the group in 2014, as a sanction for the military territorial dispute with Ukraine, regarding the Crimea region.

In the case of the Asia-Pacific Group, strong economies are concentrated, such as Japan (also a G7 member) and South Korea, as well as emerging markets of developing economies, such as India and Indonesia, countries that are part of the G20 economic group and the latter also of the MINT.

Regarding the Western Europe and Others Group, the presence of components of G7 (Germany, Canada and Italy), other advanced economies of the euro area and Oceania, represented by Australia (G20) and New Zealand, as well as the emerging economy of Turkey (G20 and MINT), stands out.

The Latin America and Caribbean Group is composed only of emerging markets and developing economies, among which the G20 members stand out: Brazil, Mexico (also MINT) and Argentina.

About the African Group, the members have more modest economies, still in development, with emphasis on Nigeria and South Africa, both participants in G20, and, respectively, MINT and BRICS.

Table 6 presents the descriptive statistics of the GDP of the studied groups, composed of the respective means, standard deviations and maximum and minimum values of the states.

Table 6 – 2019 Descriptive statistics of Gross Domestic Product

Groups	n	Minimum	Maximum		S
Permanent Members	5	1637,89	21439,45	8533,63	7912,2447
African	11	10,20	0.0.0.1. 446,54	0.0.0.2. 144,7964	0.0.0.3. 148,5890
0.0.0.4. Asia-Pacific	0.0.0.5. 8	0.0.0.6. 44,17	0.0.0.7. 5154,47	0.0.0.8. 1485,2213	0.0.0.9. 1649,7661
0.0.0.10. Eastern Europe	0.0.0.11. 4	0.0.0.12. 66,25	0.0.0.13. 565,85	0.0.0.14. 256,5475	0.0.0.15. 189,2840
0.0.0.16. Latinoamérica y el Caribe	0.0.0.17. 10	0.0.0.18. 61,02	0.0.0.19. 1847,02	0.0.0.20. 472,535	0.0.0.21. 572,0168
0.0.0.22. Europa Ocidental e outros	0.0.0.23. 15	0.0.0.24. 204,67	0.0.0.25. 3863,34	0.0.0.26. 1005,872	0.0.0.27. 938,2198
0.0.0.28.Total	0.0.0.29. 53				

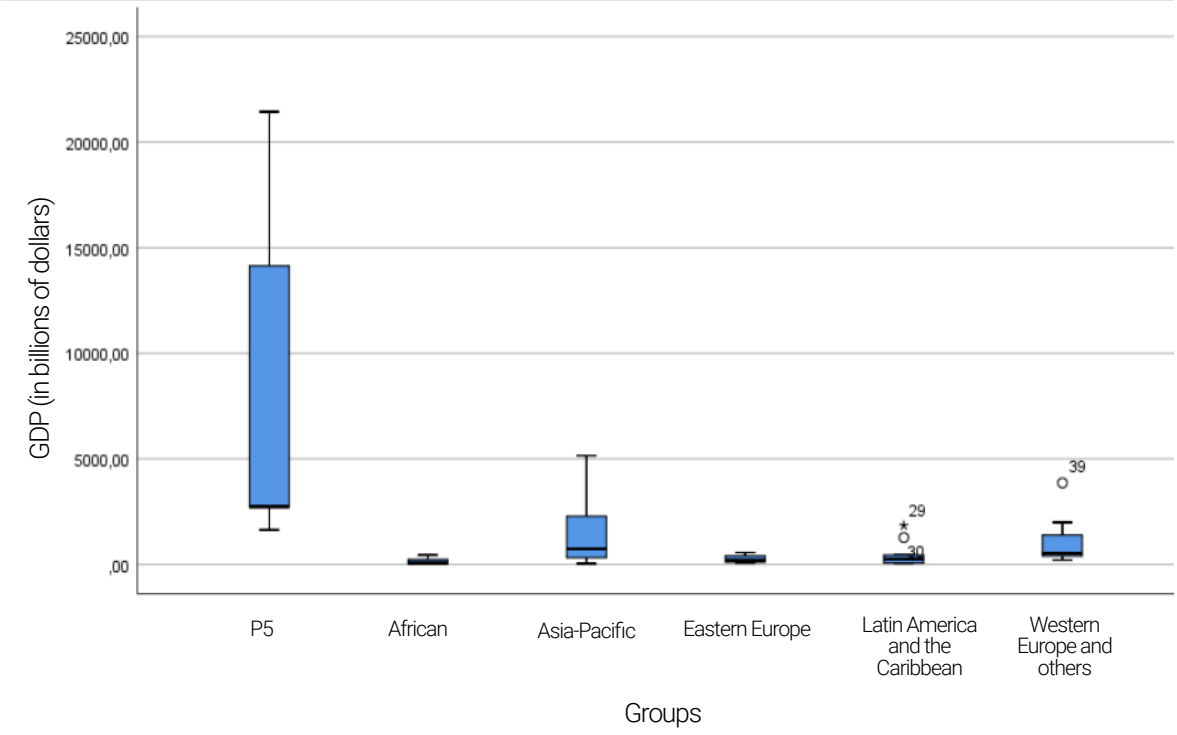
Source: The authors (2022).

Caption: = sample mean; S = standard deviation.

As stated above, the Permanent Members Group has the highest average value of GDP (8533.63 billion dollars), among which the maximum is presented by the USA (21439.45 billion dollars). Regarding this indicator, the group that comes closest to the permanent members, on average, is the Asia Pacific Group, with an average GDP of 1485,2213 billion, since it is composed by quite relevant economies, as already highlighted. Next, the Western Europe and Others Group is scored with an average of 1005.872 billion, followed by the other groups that already have average GDP less than half of the latter (Latin America and Caribbean Group - 472.535; Eastern European group - 256.5475 and African Group - 144.7964).

For better understanding, the diagram relating to the sample groups is presented:

Chart 9 – *Box plot* 2019 Gross Domestic Product



Source: The authors (2022).

Note: **Outliers*: 29-Brazil; 30-Mexico and 39-Germany.

To establish the equality or difference between the mean values of the groups, the ANOVA *One Way* statistical test was again used , resulting from 53 observations (data unavailable from Cuba and Syria) and five degrees of freedom. It was found F (5.53) = 7.694 for a p-value of 0.000. Since the p-value is lower than 0.05, the null hypothesis of equality of means for any significance level is rejected. Thus, ANOVA allows to conclude that the averages are not all the same, which means that there are significant differences in GDP values between Regional Groups and permanent members.

The Levene test was performed to verify the homogeneity of the variances, which confirmed the hypothesis. According to Table 7, the result of the Tukey test is presented, and the groups that presented mean data different from each other are perceived.

Table 7 – Prueba de Tukey para el indicador del PIB

		Difference from Means	Standard Error Lower Tail	Sig. Upper Tail	Confidence interval 95%	
P5	AG	8388,83364*	1475,32423	,000	4006,4246	12771,2427
	APG	7048,40875*	1559,37479	,001	2416,3299	11680,4876
	EEG	8277,08250*	1834,91134	,001	2826,5300	13727,6350
	LACG	8061,09500*	1498,19884	,000	3610,7376	12511,4524
	WEOG	7527,75800*	1412,51541	,000	3331,9208	11723,5952
AG	P5	-8388,83364*	1475,32423	,000	-12771,2427	-4006,4246
	APG	-1340,42489	1270,99632	,897	-5115,8837	2435,0339
	EEG	-111,75114	1597,08533	1,000	-4855,8481	4632,3458
	LACG	-327,73864	1195,14922	1,000	-3877,8957	3222,4185
	WEOG	-861,07564	1085,80923	,967	-4086,4414	2364,2901
APG	P5	-7048,40875*	1559,37479	,001	-11680,4876	-2146,3299
	AG	1340,42489	1270,99632	,897	-2435,0339	5115,8837
	EEG	1228,67375	1675,03722	,977	-3746,9771	6204,3246
	LACG	1012,68625	1297,47825	,970	-2841,4364	4866,8089
	WEOG	479,34925	1197,51820	,999	-3077,8448	4036,5433
EEG	P5	-8277,08250*	1834,91134	,001	-13727,6350	-2826,5300
	AG	111,75114	1597,08533	1,000	-4632,3458	4855,8481
	APG	-1228,67375	1675,03722	,977	-6204,3246	3746,9771
	LACG	-215,98750	1618,23970	1,000	-5022,9229	4590,9479
	WEOG	-749,32450	1539,25298	,996	-5321,6321	3822,9831
LACG	P5	-8061,09500*	1498,19884	,000	-12511,4524	-3610,7376
	AG	327,73864	1195,14922	1,000	-3222,4185	3877,8957
	APG	-1012,68625	1297,47825	,970	-4866,8089	2841,4364
	EEG	215,98750	1618,23970	1,000	-4590,9479	5022,9229
	WEOG	-533,33700	1116,69148	,997	-3580,4376	2783,7636

		Difference from Means	Standard Error Lower Tail	Sig. Upper Tail	Confidence interval 95%	
WEOG	P5	-7527,75800*	1412,51541	,000	-11723,5952	-3331,9208
	AG	861,07564	1085,80923	,967	-2364,2901	4086,4414
	APG	-479,34925	1197,51820	,999	-4036,5433	3077
	EEG	749,32450	1539,25298	,996	-3822,9831	4487,2578
	LACG	533,33700	1116,69148	,997	-2783,7636	3166,6965

Fonte: os autpres (2022).

Note: *the difference of the means is significant for level of 0.05

From the analysis of this third indicator, it can be inferred that, once again, the Permanent Members group had a significantly different mean than the averages of all Regional Groups, which showed no differences between themselves. Based on the above, regarding the comparison of GDP, a similar situation is reproduced as previously postulated, with the superiority of the permanent members over the other groups, which may not give active voice to the Regional Groups in exerting pressure for possible aspirations for a Council reform. However, it should be considered the presence of thriving economies, developed and emerging markets, of states that also integrate groups such as G7, G20, BRICS and MINT, with economic potential for candidacy for the permanent seat, admitting the reform scenario.

In addition, annual GDP growth rates by sample group are reported graphically for the period between 1980 and 2019.

It begins with the Permanent Members Group, from the evaluation of Chart 10, below:

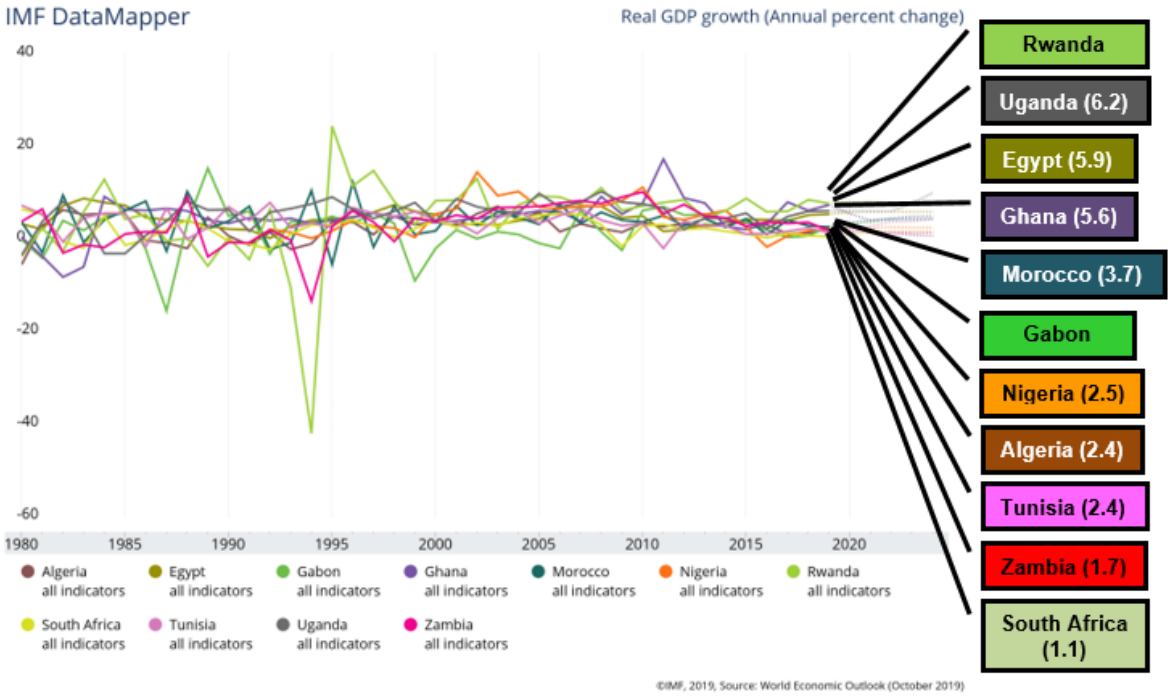
Chart 10 – Permanent Members Group annual GDP growth rate (1980-2019)

Source: Adapted from International Monetary Fund (2019).

According to the graphic reading, the Permanent Members Group shows a higher growth rate by China (5,8%), which has shown some negative oscillation in the last eight years period. The United States, France and the United Kingdom western economies were heavily impacted by the 2008 financial crisis, but they show recovery and growth stability. Unlike the others, Russia, which was in contraction, with negative growth, influenced by the devaluation of its currency and the sanctions imposed due to the crisis with Ukraine, has shown recovery since 2015.

Below is the fluctuation in GDP growth rates for the African Group:

Chart 11 – African Group annual GDP growth rate (1980-2019)

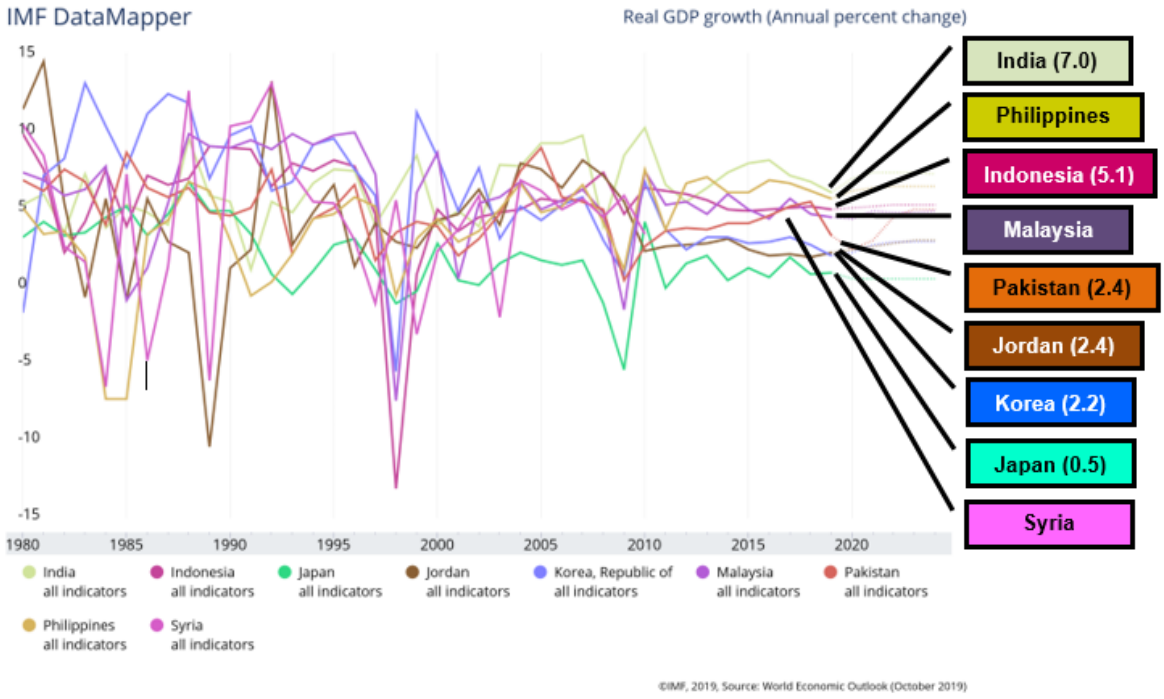


Source: Adapted from International Monetary Fund (2019).

The economies of the group, despite being the most fragile in the context of international markets, also present more room for growth. This way, currently, all exhibit positive values. The two most robust economies, Nigeria and South Africa, show lower growth rates than most other states, at 2.5% and 1.1%, respectively.

The chart below shows GDP growth for the Asia-Pacific Group.

Chart12 – Asia-Pacific Group GDP annual growth rate (1980-2019)

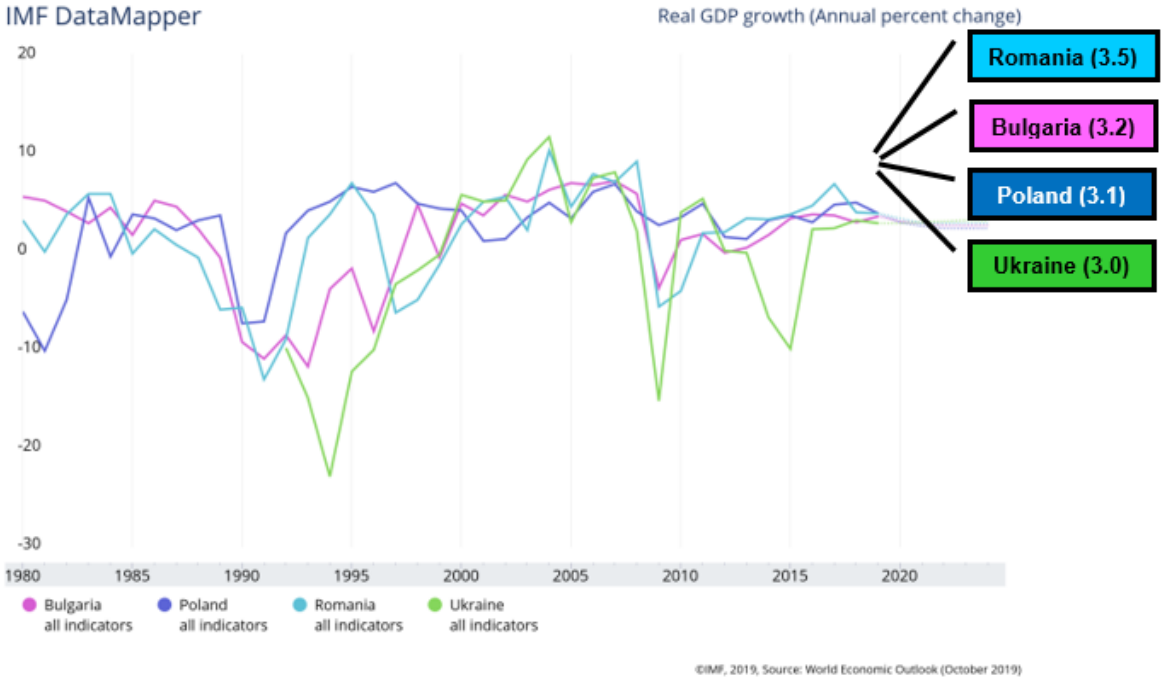


Source: Adapted from International Monetary Fund (2019).

The strength of the Indian economy is evident, with oscillations, but growth, occupying the fifth position in the world and the second in the group. Japan, which has the highest economic development of the group and the third largest GDP in the world, has shown more modest growth rates, currently in the range of 0.5%. The advanced economy of South Korea shows an intermediate growth rate for the group, in the range of 2.2%, while the emerging market of Indonesia, grows 5.1%, in 2019.

Considerations relating to the Eastern European Group are now carried out as it follows:

Chart 13 – Eastern Europe Group annual GDP growth rate (1980-2019)

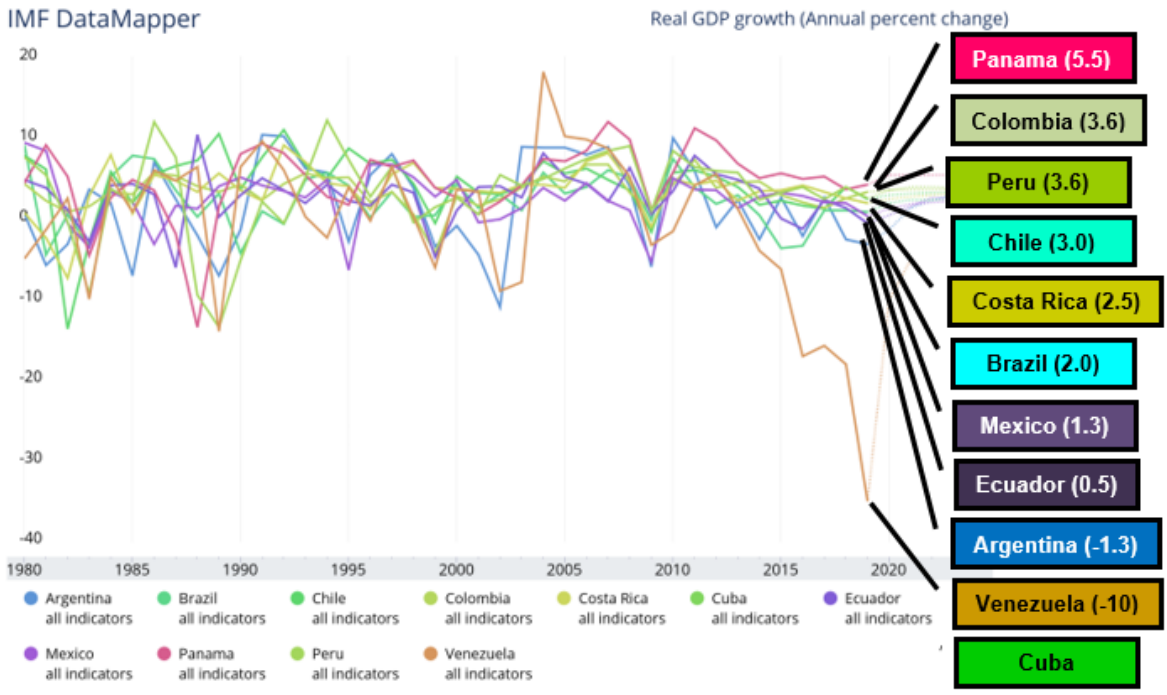


Source: Adapted from International Monetary Fund (2019).

All economies of the group have similar growth rates in the 3% range. The Ukrainian economy moves away from contraction, with negative development, especially in 2015, possibly as a reflection of the military crisis of territorial dispute with Russia, resuming growth from then on.

The characteristics of GDP growth for the Latin America and Caribbean Group are discussed below:

Chart 14 – Latin America and the Caribbean Group annual GDP growth rate (1980-2019)

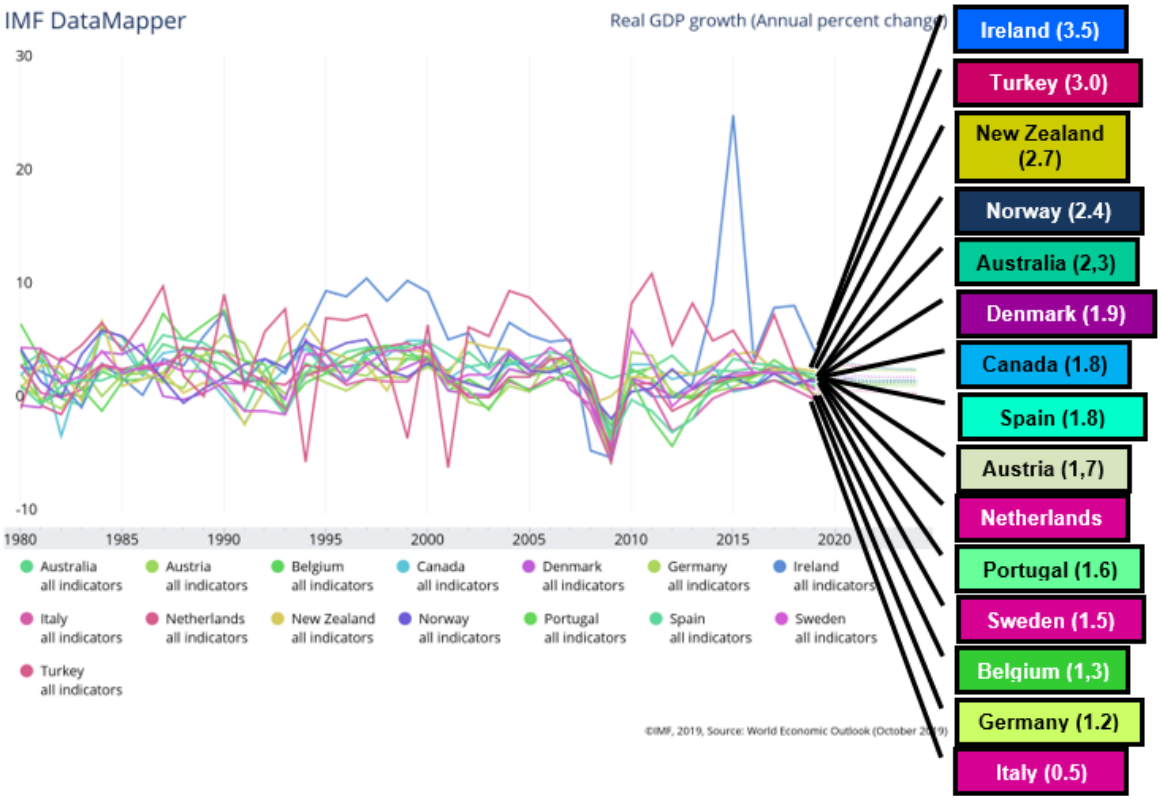


Source: Adapted from International Monetary Fund (2019).

Two of the most advanced economies in Latin America, members of G20, represented by Brazil and Argentina, present, at the moment, clear signs of retraction as a result of the crisis faced by the countries. The first suggests some signs of recovery from the negative growth of previous years, with the current growth of 2%. The second, still has its reduced economy slowing by 1.3%. Mexico, another emerging market from the continent, a participant in G20 and MINT, presents an equally moderate performance with GDP growth in the 1.3% range. Panama, Colombia, Peru and Chile have positive growth rates of more than 3%. Venezuela, which remains in economic and political crisis, appears at the bottom end of the group with negative growth of 10%.

The information for the Western Europe and others Group is shown below:

Chart 15 – Western Europe and Others Group GDP annual growth rate (1990-2015)



Source: Adapted from International Monetary Fund (2019).

As the permanent members in the past decade, this group has also been heavily impacted by the North American subprime crisis, which reinforced the public debt problem in the euro area, causing markets to shrink from 2008. However, it can be seen that all members show signs of recovery, some economies already stronger than others and, in general, with positive growth.

In that regard, from the analysis of the indicator annual GDP growth rate of *proxy* Economic Development, it can be inferred that, naturally, the aforementioned rates of each state are the accurate portrayal of performance in a period, and it is possible, from the graphic observation, to understand the evolutionary trends. It is presented, in this way, great variation and heterogeneity of behaviors. The most advanced economies, present in the Permanent Member Groups and Western Europe and others, have suffered from the effects of the crisis already described, however, they are in the process of strengthening and recovering. Countries with lower economic development, such as the developing markets of the African Group, have greater room for growth. The percentage assessment of annual economic growth, alone, does not seem to be a substantial indicator of the possibility of influence of states in the international system.

9 Conclusion

he period of transformation in global geopolitics and the apparent reordering in the post-Cold War instigate the imaginary of the possibility of a real restructuring in the governance of the international system. The new actors, whether emerging peripheral countries, non-governmental organizations, terrorist groups, internet social networks or even the individual himself, begin to exert increasingly forceful influences and pressures to change the hegemonic framework and the relationship of the exercise of world power.

Almost 75 years after the UN founding, new global challenges, reinforced by a differentiated power relationship between transnational actors, suggest the greater insertion of peripheral and emerging states, with the resulting need for a renewed and more prepared Security Council to face them. This study sought, therefore, to verify the behavior of the economic expression of National Power of the Regional Groups, with their respective members, before the referential constituted by the Permanent Members of the UNSC. The evaluation was carried out by means of criteria and indices of economic governance, within a system of established institutions and procedures used to measure the objectives in this field, that is, within a context of evaluation of economic progress.

The expectation was to identify the distances between groups and states, and, mainly, to point out the approximations that would allow inferring about the specific potential of candidacy for the permanent seat, in a possible context of reform in the UNSC, in the prospecting of the course of the planet economy as a factor of influence for a reform in the Council.

National Material Capabilities, Contribution to the United Nations regular budget and GDP were established as economic indicators in order to investigate the research objective and potentially confirm or refute the study hypothesis.

From the foregoing, it is concluded that there is a significant difference in the light of statistics in the average values of all indicators of proxy Economic Development of the variable "economic expression of National Power", between the Regional Groups and the Permanent Members, with the results of the latter, superior to the others. This information suggests the distancing of the permanent members and the apparent limitation of the exercise of power of the Regional Groups, as a possible obstacle to the possibility of influencing a Council reform.

Regarding National Material Capabilities, moreover, it can be seen, from a more particular observation, that there are states highlighted in their regional groups, such as India, Japan, Brazil, Germany and South Korea. The first two do not have indices higher than China and the USA, while the rest show higher results than France and the United Kingdom.

Regarding the Contribution to the United Nations regular budget, arguably the Permanent Members Group is superior to all others with almost half the annual membership rate. However, seeking individualized analysis, Japan and South Korea, from the Asia-Pacific Group, stand out, as, 3°and 11o largest contributors; Brazil and Mexico, at 8th and 16th positions respectively, as well as Germany, Italy, Canada, Australia, Spain, Turkey, the Netherlands and Sweden, from the Western Europe Group and others, all among the 10% of highest contribution to the UN.

Regarding the GDP of the Regional Groups, the African group, even with modest developing economies, Nigeria and South Africa markets, both participants in G20, and, respectively, of MINT and BRICS, should be mentioned; in the Asia-Pacific Group, the advanced economies of Japan (also a member of G7) and South Korea are considered, in addition to present important emerging markets of developing economies, such as India and Indonesia, countries that are part of the G20 economic, BRICS and MINT, respectively; in the Latin America and Caribbean Group the markets of emerging and developing economies of members of G20-Brazil, Mexico (also MINT) and Argentina; and, regarding the Western Europe and Others Group, the presence of components of G7 (Germany, Canada and Italy), and other advanced economies of the euro area and Oceania, represented by Australia (G20) and New Zealand, as well as the emerging economy of Turkey (G20 and MINT).

Thus, it corroborates with previously observed ideas of the growing economic interdependence between developed and emerging markets and, not as a constituted Regional Group, but in an individualized way, these countries can justify undertaking management, exercising power in the perspective of influencing a reform of the UNSC and consequent candidacy for the permanent seat.

Finally, it is expected that this research may contribute to Comparative Policy Studies, especially on the adoption of quantitative methods. It is expected that further work can continue the outline presented, in order to produce substantial and in-depth debates on the subject of UNSC reform.

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The customization of technology readiness assessment processes based on the TRL scale: development of a methodology for the Brazilian Army

La personalización de los procesos de evaluación de la preparación tecnológica basados en la escala TRL: desarrollo de una metodología para el Ejército Brasileño

Abstract: Technology Readiness Assessment (TRA) based on the TRL scale is a process aimed at minimizing problems in defining the stage of maturation of technologies, as well as providing efficient communication between specialists, managers and other stakeholders in organizations that acquire products and systems of high technological level. In this context, the work analyzes the customization of the TRA process from the perspective of a focal organization. For this purpose, we use as a case study the DCT (Department of Science and Technology), focal organization of a network for the development of defense technologies and products within the Brazilian Army (EB). The data collected came from the bibliographic review (study of customizations made by reference organizations in the national and international scenarios) and empirical data from DCT programs. With this data, it was possible to propose a framework methodology in the TRL scale customized to the specificities of EB.

Keywords: innovation management; systems engineering; technology readiness; TRL; Brazilian Army.

Resumen: La Evaluación de la Preparación Tecnológica (EPT) basada en la escala TRL es un proceso que tiene como objetivo minimizar los problemas en la definición de la etapa de maduración de las tecnologías, así como proporcionar una comunicación eficiente entre especialistas, gerentes y otras partes interesadas en las organizaciones que adquieren productos y sistemas de alto nivel tecnológico. En este contexto, el trabajo analiza la personalización del proceso EPT desde la perspectiva de una organización focal. Para ello, se utiliza como caso de estudio el DCT (Departamento de Ciencia y Tecnología), organización focal de una red para el desarrollo de tecnologías y productos de defensa en el ámbito del Ejército Brasileño (EB). Los datos recolectados provienen de la revisión bibliográfica (estudio de personalizaciones realizadas por organizaciones de referencia en el escenario nacional e internacional) y de datos empíricos de los programas DCT. Con estos datos, fue posible proponer una metodología para enmarcar la escala TRL personalizada para las especificidades del EB.

Palabras-clave: gestión de la innovación; ingeniería de sistemas; preparación tecnológica; TRL; Ejército brasileño.

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1 Introduction

The Research and Development (R&D) of high-tech products is often characterized by the integration of new components and subsystems that are in the state of the art, which entails great complexity and a high degree of uncertainty during the early phases of technological development (DAVIES *et al.*, 2011; MÖLLER; HALINEN, 2017).

Additionally, in these early phases, it is more challenging to accurately assess the stage of evolution of new technologies and the adequate level of maturity to integrate them, in order to conceive a novel product (OLECHOWSKI *et al.*, 2020). Despite these difficulties, these evaluations are important, because the integration of immature components and subsystems can result in increased costs and delay in R&D programs and projects of high-tech products (UNITED STATES, 2015). In addition, both the implementation and the evolution of such programs and projects usually depend on decisions by managers that lack specialized technical knowledge. In this context, the perceptions about technology maturation by actors from different backgrounds tend to be diffuse, hindering the common understanding about the stage of evolution of the technologies involved in the design of the desired product (SALAZAR; RUSSI-VIGOYA, 2021).

In order to mitigate the problems of estimating the maturation stage and the efficient communication of these stages among specialists, managers and other stakeholders in R&D activities, NASA developed, in the mid-1970s, the Technology Readiness Level (TRL) scale, which standardized the maturation of technologies into nine readiness levels (MANKINS, 2009).

NASA R&D activities generally target products of very high complexity, which involve many customized components and which are produced in a few units (sometimes a single unit), such as long-range telescopes and space rockets.

These characteristics are typical of Complex Product Systems (CoPS) (HOBDAY, 1998), which differ from mass-produced products, or commodities. As such, the nature of NASA products and organizational culture were considered in the development of the TRL scale. Thus, other central organizations with similar issues, but dealing with R&D projects of different natures and having disparate organizational cultures, began to customize the Technology Readiness Assessment (TRA) process according to their different contexts. As an example of organizations that have adopted this approach, the U.S. Department of Defense (DoD) (UNITED STATES, 2009), the U.S. Department of Energy (DoE) (UNITED STATES, 2011) the European Space Agency (ESA) (ESA, 2017) and, in Brazil, the DCTA (Department of Aerospace Science and Technology) (ROCHA; MELO; RIBEIRO, 2017) the AEB (Brazilian

Space Agency) (XAVIER *et al.*, 2020). These focal organizations are characterized by interacting in a large business and scientific research network, composed of small, medium and large companies, funding agencies, universities, research institutes, etc.

Despite the existence of different customized TRL evaluation processes, as far as the authors' knowledge is concerned, there are no studies that demonstrate how the customization of these processes can be carried out. Therefore, in order to fill this gap in the specialized literature, this article aims to explore the TRA process in focal organizations of a business and scientific research network that develop high-tech products. As a research question, the study proposes to answer: **how to customize the TRA process from the perspective of a focal organization?**

For this purpose, the DCT (Department of Science and Technology), a focal Organization of a network for the development of defense technologies and products within the Brazilian Army (EB), was used as a case study, which, by serving as the unit of analysis for this research question, enabled, additionally, the creation of a customized methodology for the EB particularities.

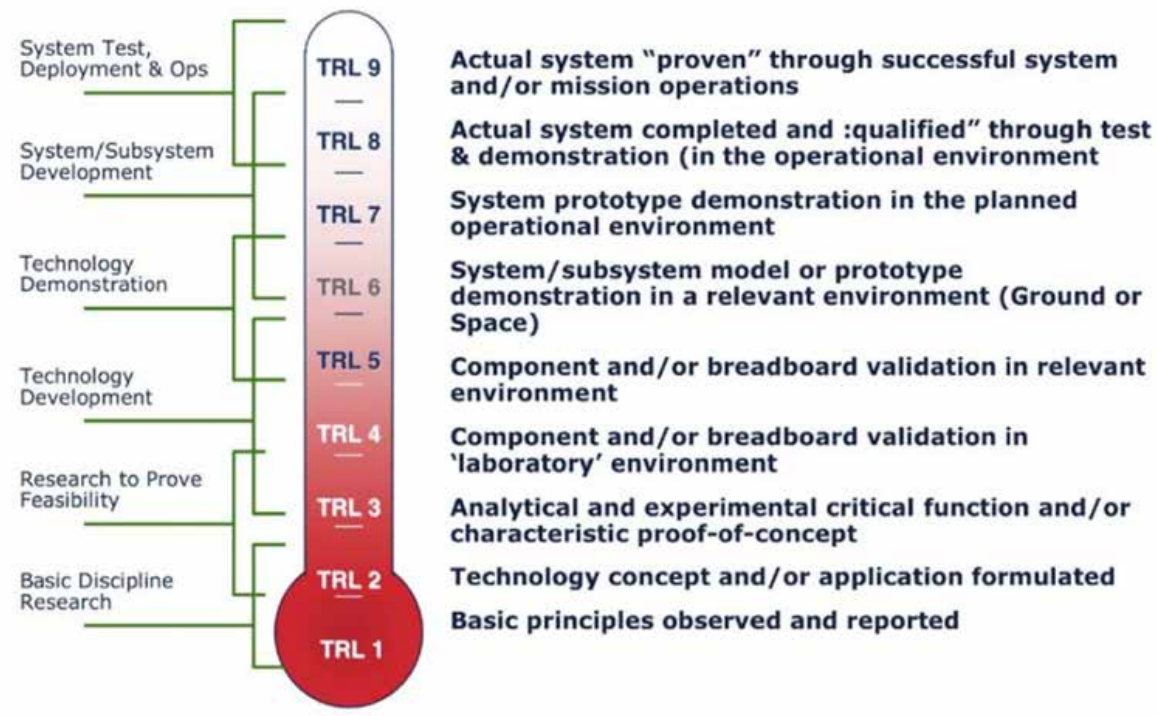
The rest of this article is organized as follows: Section 2 presents a bibliographic reference on the TRA process based on the TRL scale and issues of organizational culture and innovation that impact the process. Section 3 addresses the general methodological aspects used in the research. In Section 4, the framework methodology for the TRL scale customized for the EB is detailed. Section 5 discusses the results. Finally, the final considerations of the study are put in Section 6. It should be noted that the appendix contains a glossary with the definition of the terms used in the methodology described in Section 4.

2 Bibliography

2.1 The TRA process based on the TRL scale

In order to measure technology readiness in the development of space systems, the TRL tool was created. Developed in the mid-1970s by NASA, this tool provides a measure relative to the state of a new technology in relation to its use for future space systems. It was organized into nine (9) levels of readiness, as shown in Figure 1 (MANKINS, 2009).

Figure 1 – Technology readiness scale



Source: Mankins (2009).

The adoption of the TRL scale and a thorough set of procedures to infer about the level of readiness can be considered an impersonal interaction mechanism, as it establishes a common language and identifies critical milestones in the technology maturation process (SAUSER *et al.*, 2010). In this way, to improve communication between actors of a complex network, established to develop R&D projects in collaboration (SAUSER *et al.*, 2010), avoids false expectations about the development stage and minimizes risks in systems integration (GRANT, 1996).

There are other scales, but the one that has been used most frequently to systematically communicate the level of maturity of technologies to be incorporated into products and systems is the TRL (UNITED STATES, 2020a).

For this reason, over time, organizations have developed methodological frameworks over the TRL scale in order to meet their specific needs (JEAN; LE MASSON; WEIL, 2015) creating their own procedures for TRA. For example, the U.S. Government Accountability Office (GAO), the body of the legislative branch responsible for audit services, evaluations and investigations of Public Accounts of the United States government, establishes a guide with the following five steps for conducting TRA processes:

1) Structuring an TRA plan in the context of a procurement program or project: definition of the framework methodology on the TRL scale to be used, definition of TRA points throughout the life cycle (decision milestone), definition of the TRA team and its role in each of the decision milestones (purpose of the evaluations, reference values, possible paths after the evaluations, etc.);

2) Identify critical technologies: technology criticality has its own definitions and criteria, according to the organization context;

3) Evaluate critical technologies: assessment of the maturity level of critical technologies based on the framework methodology on the TRL scale;

4) Prepare an TRA report: consolidation of the results obtained during the evaluation of critical technologies; and

5) Use TRA report results: analysis and use of the report data in the development of a technology maturation plan (UNITED STATES, 2020a).

This GAO guide shows that the TRL scale is the tool that underpins the entire TRA process. This perception justifies the argument that the customization of the TRA process from the perspective of a focal organization begins with the customization of methodological framework over the TRL scale. This is the path taken by the DoD (UNITED STATES, 2009), DoE (UNITED STATES, 2011), ESA (ESA, 2017) and, in Brazil, by DCTA (ROCHA; MELO; RIBEIRO, 2017) and AEB (XAVIER *et al.*, 2020).

Aiming to adapt the original TRL scale to the characteristics of its programs and procurement projects, DoD developed a methodology for framing the TRL scale to assess the maturity of critical technologies (CTEs, Critical Technology Elements) in systems of hardware and software. In addition, the Department also has a methodology for the biomedical area developed by United States Army Medical Research and Materiel Command (USAMRMC). DoD combines the use of its methodology with the life cycle management of defense systems by referencing TRL levels for two decision milestones.

- **Milestone B**: marks the end of the phase of technology maturation and risk reduction. At the end of this phase, it is expected that all critical technologies have been demonstrated in a relevant environment (TRL 6);

- **Milestone C**: marks the end of the engineering and manufacturing development phase. At the end of this phase, it is expected that all critical technologies have been demonstrated in an operational environment (TRL 7) (UNITED STATES, 2009).

In order to simplify the determination of the appropriate TRL level for a technology, the AFRL (Air Force Research Laboratory), organization framed in the DoD organizational chart, developed a calculator that establishes specific steps that must be fulfilled for each level of the technology readiness scale. This tool contemplates the evaluation of three types of system elements: hardware, software, and hardware/software combined. The use of the calculator is carried out in two stages. In the first, a set of nine questions is applied for initial estimation of the TRL level of the technology. In the second, a detailed questionnaire is used to confirm whether the previously estimated TRL level is adequate. If confirmation does not take place, the procedure shall be repeated with the TRL level immediately lower. During the evaluation, a maximum of 58 (fifty-eight) questions are presented to the evaluator (NOLTE; KENNEDY; DZIEGIEL, 2003).

In the wake of DoD, DoE has made adaptations to the framework in the TRL scale to give greater focus to risk analysis in the energy area. Verification and validation of Safety Structures, Systems and Components (SSCs) were incorporated into the methodology as a way to mitigate risks for both workers in the sector and the general public. To operationalize the identification of the TRL level of a technology, the Department makes use of its own TRL calculator. This tool follows the two-step process (preliminary estimation and confirmation of maturity level), along the lines of the DoD calculator. During the evaluation, a maximum of 44 (forty-four) questions are presented to the evaluator (UNITED STATES, 2011).

In the European context, ESA has customized the framing methodology on the TRL scale for three distinct segments: space systems, ground systems and space-based software systems (ESA, 2020). In addition, the agency seeks to combine its methodology with the phases of the life cycle of its projects and with the elaboration of technology roadmaps. TRL level 6 is adopted as the minimum requirement for entry in the technologies integration phase (ESA, 2017).

In the Brazilian scenario, Rocha, Melo and Ribeiro (2017) present the customization carried out within the scope of DCTA. Seeking to adapt the original TRL scale to the Brazilian aerospace context, the TRL IAE-ITA methodology and its respective calculator were developed. The tool consists of a questionnaire with 89 (eighty-nine) questions divided into the following 5 (five) aspects:

- **NBR ISO 16290: 2015:** checklist the Brazilian standard for defining technology maturity levels for space systems (ABNT, 2015);

- **Technological:** relevant to the confirmation of the description of NBR ISO 16290: 2015;

- **Economic:** they address risk analysis and project development (schedule, budget, etc.);

- **Legal-political:** related to development feasibility, possibility of development embargoes, and legal issues; and

- **Documentary:** related to knowledge management, which must be documented, for possible reproduction (ROCHA; MELO; RIBIERO, 2017).

Following a similar approach, AEB developed a TRL calculator called IMATEC, to support decisions in the management of the Brazilian Space Program, more specifically the National Program of Space Activities. The agency customizes the TRL tool for use in conjunction with the Product Breakdown Structure (PBS). Creating a PBS and assessing the level of maturity of all components of a technological product makes it possible to exhaustively estimate the risk at a certain stage of development, given that the degree of readiness of an element of PBS will be the lowest TRL index of any of its constituent elements. Within this perspective, the components of PBS with the lowest TRL index are called "bottlenecks" of the product, since they propagate their low technology maturity indices to the framing elements in the PBS hierarchical tree. When assessing the TRL level of a PBS component, the calculator presents questions incrementally. If all questions on one level are answered positively, the questions on the next level follow. This procedure is performed until the TRL level is estimated. During the evaluation of each PBS component, a maximum of 14 (fourteen) questions are presented to the evaluator (XAVIER *et al.*, 2020).

In short, many organizations create their TRA methods according to their specific needs, without, however, modifying the essence of the original TRL scale. By the analysis carried out, it is verified that these processes of customization of the framework methodology in the technology readiness scale took into account two fundamental factors: adaptation to the organizational culture and the development of a TRL calculator.

- **Adaptation to organizational culture:** customization depends on the organizational culture of the business network to which the focal organization belongs and its technology management macroprocesses. For example, while the DoD frames TRA within the life cycle of its systems (UNITED STATES, 2009), the DCTA is concerned with issues related to technological, economic, documentary and legal-political matters (ROCHA; MELO; RIBIERO, 2017). In addition, despite the adoption of some areas of knowledge, such as systems engineering, each organization has different procedures related to planning, requirements management, R&D, testing, evaluation and certification, factors that directly impact the TRA process.

- **TRL Calculator:** during the analysis of the customization processes by the focal organizations studied, it was found that the development of the methodology is usually accompanied by the development of a calculator. In contrast to non-standard assessments, a calculator consisting of a standard set of questions simplifies the determination of the appropriate TRL level for a technology, as well as provides repeatability and consistency to the process (UNITED STATES, 2020a). Non-standard assessment of the readiness stage of a technology often leads to discrepancies between the TRL level perceived by different parties involved in a project (ALTUNOK; CAKMAK, 2010; FRERKING; BEAUCHAMP, 2016; MUDA; GOVINDARAJU; WIRATMADJA, 2022; NOLTE; KENNEDY; DZIEGIEL, 2003).

Table 1 summarizes the main customizations made by the focal organizations analyzed, according to the two factors listed.

Table 1 – Main customizations of the framework methodology in the TRL scale carried out by focal organizations that acquire high-tech products and systems

	Adaptation to organizational culture	TRL Calculator
DoD	• Suitability to the programs and projects management for obtaining defense systems; • Methodology for assessing the maturity of critical technologies in hardware, software and in the biomedical field; • Combines the use of the technology readiness scale with the life cycle management of defense systems, defining reference TRL levels for two decision milestones (TRL 6 for Milestone B and TRL 7 for Milestone C).	AFRL TRL calculator with 2-step process (preliminary estimation and maturity level confirmation). Tool with the maximum number of 58 questions.
DoE	• Suitability to project management in the energy area; • Focus on risk analysis; • Incorporates the Verification and Validation of Safety Structures, Systems and Components	Own TRL calculator with 2-step process (preliminary estimation and maturity level confirmation). Tool with the maximum number of 44 questions.
ESA	• Suitability for aerospace systems in the European context; • Methodology for three distinct segments: space systems, terrestrial systems, and software based systems; • Combines the use of the technology readiness scale with the phases of the project life cycle and the elaboration of technology roadmaps; • TRL Level 6 is adopted as a minimum requirement for entry into the technology integration phase.	Calculator development / employment is not reported.
DCTA	• Adequacy with the Brazilian standard NBR ISO 16290:2015; • Inserts issues related to technological, economic, documentary and legal-political issues.	TRL IAE-ITA calculator, tool with 89 questions divided into 5 questions (NBR ISO 16290:2015, technological, economic, documentary and legal-political).
AEB	• Adaptation to space systems in the context of the Brazilian Space Program; • Combines the framework methodology on the TRL scale with PBS; • Focus on risk analysis of projects related to the development of high-tech products.	IMATEC TRL calculator, tool with the maximum number of 14 questions for the evaluation of each of the PBS components.

Source: the authors (2022).

2.2 Aspects of organizational culture and innovation that impact the process

The concept of organizational culture refers to the shared values, beliefs, nomenclature, rituals, history, intellectual and operational traditions, pride in achievements, policies and practices, rules of conduct, philosophy, and other aspects that define an organization (GAYNOR, 2002). Organizational culture is conceived as a set of values and basic assumptions expressed in symbolic elements that, in their ability to order, assign meanings and build organizational identity, act as an element of communication and consensus (FLEURY; FISCHER, 1989).

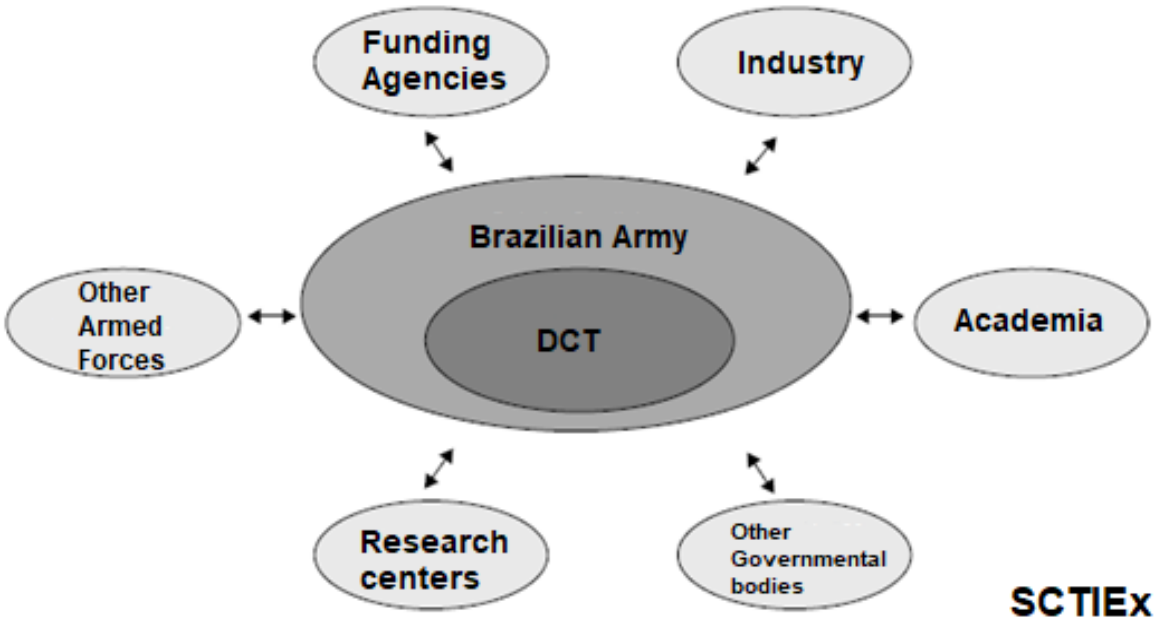
This search for accurate communication and consensus in the organizational environment has been addressed in the literature of organizational theory in different contexts, focusing, directly or indirectly, on mechanisms that contribute to increasing common understanding (FRANÇA JUNIOR; GALDINO, 2019). Promoting communication, integrating tacit knowledge and understanding different perspectives in complex networks composed of actors with diverse backgrounds and experiences are problems faced by organizations in charge of managing and carrying out R&D activities of high-tech products and systems (DAVIES *et al.*, 2011).

According to Schons, Prado Filho and Galdino (2022), studies carried out under EB have suggested that it is imperative to develop the capacity to carry out Science, Technology and Innovation (ST&I) activities in complex collaborative networks of national scope to strengthen the links between academia, industry and government (triple helix) (ETZKOWITZ; ZHOU, 2017) and undertake an open innovation model (CHESBROUGH, 2003) it replaces the traditional closed innovation model.

In this context, the Army Science, Technology and Innovation System (SCTIEx), a core element of the Brazilian defense sector, presents itself as a fundamental vector in the EB transformation process (FRANÇA JUNIOR; GALDINO, 2019).

For the design, planning and R&D phases of the life cycle of military equipment, EB has procedures, activities, methodologies, nomenclatures, standards and instructions specific to its organizational culture that end up being shared by the entire SCTIEx (LIMA, 2007). Figure 2 illustrates the SCTIEx structure, composed of military and civilian, public and private organizations that interact throughout the military material R&D process (BRASIL, 2012).

Figure 2 – Army Science, Technology and Innovation System



Source: adapted from Brazil (2012).

Therefore, in view of the particularities of the SCTIEx organizational culture (points detailed in Section 4), the need for customization of the framework methodology in the TRL scale was identified (FRANÇA JUNIOR; GALDINO, 2019), similar to the customizations undertaken by the focal organizations presented in Section 2.1.

3 Methodological aspects

The objective of this research was to explore the customization of the TRA process from the perspective of a focal organization. This goal was pursued from the perspective of a high-tech product development network. According to Dubois and Gadde (2002), research related to this type of network presents a series of interdependent variables that add complexity to the analysis. Similarly, Dubois and Gibbert (2010) argue that high-tech product development networks present researchers with particular challenges, since they do not constitute closed, delimited or clearly defined systems. In this context,

> The main units of analysis are organizations and relationships that are difficult to access and complex in structure in comparison, for example, with consumer markets. As a result, a case study of a single or a small number of such entities can provide a large amount of data, largely qualitative, that can be written as a case (EASTON, 2010, p. 118).

The case study can be considered as an in-depth and holistic description and analysis of a delimited phenomenon, such as a program, an institution, a person, a process or a social unit (MERRIAM, 1998). In this type of research, various methods of data collection and analysis are adopted to develop and understand the case, shaped by the context and emerging data (STAKE, 1995). As a qualitative method, case study research is a linear but also iterative process, involving the activities of planning, designing, collecting and analyzing data, investigating a contemporary phenomenon within its context (YIN, 2017). It is also considered more appropriate to study questions of "how" and "why", since they deal with operational links to be traced over time (YIN, 1994).

For this purpose, a case study was conducted using the SCTIEx network (BRASIL, 1994), in which DCT can be considered a focal organization. The actors in this network belong to quite diverse organizations, such as universities; small, medium and large companies; funding bodies; research institutes, in addition to the users of the developed products of the network themselves (FRANÇA JUNIOR; GALDINO, 2019).

DCT plays a key role in the life cycle management of defense products, especially in the conceptual formulation and procurement phases[1]. In this sense, this department has all the characteristics of a focal organization that needs to insert a technology maturity assessment process aligned with its high-tech product management macroprocesses. In addition, the scope achieved by SCTIEx regarding the diversity of actors and variety of products of interest makes this an emblematic case study, given that the customization in question requires the convergence of ideas between actors of varied backgrounds and understandings about technology.

3.1 Data Collection

In a first round of discussion of the TRL calculator customized for EB (fourth step of the diagram in Figure 5), a workshop was done, which was attended by several experts from DCT. Divided into 4 (four) focus groups, according to the affinity of the activities of their organizations, the experts were in charge of simulating the framework of critical technologies of their choice, in the calculator. The experts, their organizations and their affinities regarding the TRL ranges are presented in Table 2.

1 R&D and/or acquisition of system or material with the technical, operational and logistical characteristics established by EB (BRASIL, 2016).

Table 2 – Expert groups consulted in workshop conducted at the Military Institute of Engineering to study the proposed TRL calculator

Specialist profile	Nº of specialists	Organization	Groups and assigned TRL Track
Teachers, researchers, heads of divisions.	7	IME (Military Engineering Institute)	**Group 1:** affinity with basic and applied research; verification of technical feasibility.
Heads and experts in R&D projects.	5	CTEx (Army Assessment Center)	**Group 2:** affinity with technology development and demonstration.
Specialists in testing defense products.	2	CAEx (Army Assessment Center)	**Group 3:** affinity with product development; integration and testing; product in operation.
Specialists in defense product development contracting.	3	DF (Manufacturing Directorate)	
Experts in technological innovation.	3	AGITEC (Army Agency for management and technological innovation)	**Group 4:** affinity with the managerial aspect and macro vision.
Students of the Army Command and General Staff School.	2	ECEME (Army Command and General Staff School)	

Source: the authors (2022).

In the simulation, after analysis and discussion, the experts of each group answered the calculator questions and framed the technology under evaluation at a TRL level, presenting, at the end, the justifications for the framing. As a result of the discussions, questions, comments, criticisms and suggestions about the calculator questionnaire emerged, which led to the elaboration of a report, whose analysis allowed the refinement of the TRL calculator.

In a second discussion phase (sixth step of the diagram in Figure 5), we sought to apply the scale and questionnaire resulting from the previous step in real projects. Three ongoing programs were selected in the DCT, the Strategic Guideline Program for the Conceptual Formulation of Armored means of the Brazilian Army (PROJETO..., 2019), Software-defined Radio Program (PRADO FILHO; GALDINO; MOURA, 2017) and the Solo – Solo Missile

1.2 Program (BRASIL, 2020). These three programs were chosen because they are in different stages of development, as a consequence contemplating in the study critical technologies and subsystems in diverse stages of maturity, thus providing a complete analysis.

Some national defense companies involved with these programs, as well as organizations belonging to the DCT itself, were consulted. The list of the actors and their subsystems evaluated is shown in Table 3.

Table 3 – List of companies, technologies evaluated and experts interviewed

Technology provider organization	Technologies and subsystems evaluated	Number of experts interviewed	Position of experts
CTEx – Laboratory of Optronics	Thermal imaging monocular; GAZE and the Multispectral Assisted Vision System.	1	Project manager.
CTEx – Department of Information Technology	Vehicular Software Defined Radio.	5	Technical experts of the RDS project.
CTEx – Missile and Rocket Group	Solo-Solo Missile 1.2.	3	Head of the group, project manager and technical specialist.
CDS	Battlefield manager	1	Project manager.
ARES	Gyro stabilized platforms; software of graphic simulation application; explosives and ammunition; fire direction electronics; REMAX; REMAN; optical systems; and electro-optical systems.	5	Commercial and marketing director, 2 Project managers and 2 technical specialists.
OPTO	Universal vision system; Optical Periscope and Optronic Systems.	3	CEO, 1 Industrial manager and 1 Industrial Director.
Equitron	Slewing and lifting actuators; energy Pack; Batteries;Situational Awareness Camera System; Transfer case; Reversing box; Brake Assembly; Lock Differential; Control panel; Shooting Display and situational awareness; Shooting Joystick control; Integration Dam with Optronics– HMI.	2	Chief Executive Officer and 1 technical specialist.

Source: the authors (2022).

In the case of companies, technical visits and interviews with key members were carried out in order to frame the selected subsystems using the TRL calculator, in its improved version. In addition, the site visit of the products and production process was allowed in order to reinforce the information provided by the companies. During the interviews the focus was to identify the methods, types and test environments that were used for the subsystems, in order to identify some criterion not observed in the refined calculator.

In the case of DCT organizations, in addition to interviews and technical visits, the experts filled out the TRL calculator, classifying the maturity levels of the subsystems and thus performing a self-assessment. Then three workshops were carried out with the specialists of CTEx, as well as a consultation within the DCT framework, where it was possible to raise new criticism and suggestions for the refinement of the calculator.

3.2 Analysis of collected data

The data collected can be divided into two types: data from the bibliographic review and empirical data obtained from the study with specialists who work in DCT programs and projects.

The bibliographic review enabled the creation of Table 1, built from the analysis of customizations carried out in important focal organizations that develop complex products and systems, such as DoD (UNITED STATES, 2009), DoE (UNITED STATES, 2011), ESA (ESA, 2017), DCTA (ROCHA; MELO; RIBEIRO, 2017) and AEB (XAVIER *et al.*, 2020). As a result of this analysis, it was possible to conclude about the main factors that lead to the customization of the TRA process: organizational culture and framing method (TRL calculator).

Empirical data from interviews and workshops, served to include, adjust or remove criteria from the custom TRL calculator, according to the experts who used it at various stages of the customization process.

4 Methodological framework on the TRL scale for EB

As discussed by França Junior and Galdino (2019), the methodology for framing a technology at TRL scale levels needs to be customized according to the particularities of organizations working with high-tech systems, such as SCTIEx (FRANÇA JUNIOR; GALDINO, 2019).

Thus, we sought to create a methodology for the EB that takes into account the needs of this institution, such as: the evaluation of technologies developed by external organizations; the evaluation of technologies developed by their organizations in partnership with external organizations; strategic R&D planning; development risk analysis; use of information collected throughout the life cycle of products obtained through R&D by the system; and increase common understanding among diverse SCTIEx actors.

In this context, a methodological framework was developed in the TRL scale (summarized in Table 4) based on the customization factors identified in Table 1.

- **Adaptation to organizational culture:** seeking adherence to the General Instructions for Life Cycle Management of Military Systems and Materials (SMEM) (IG 01-018) (BRASIL, 2016), the adequacy of the methodological framework in the TRL scale was based on three aspects:

  I. The first aspect concerns the importance of inferring about the reproducibility of products produced in large quantities (UNITED STATES, 2020b), through the evaluation of a pilot batch [2]. EB generally does not deal with complex products produced in a few units, only. It employs products of varying degrees of complexity and production volume, ranging from those produced in tens and hundreds of units to those produced in mass. This aspect underpinned the **inclusion of TRL level 10** in methodology;

  II. The second aspect relates to the need for the gradual evolution of operational and technical requirements (OR and RTLI) [3]. Due to the long duration of the defense product development process, it is difficult to accurately predict, especially in the early stages, the architecture of complex products, which usually involves a large number of components and subsystems (DAVIES *et al.*, 2011). Thus, it is essential that the evolution in question occurs as the project advances in the TRL levels, allowing OR and RTLI to be updated at appropriate times, up to a certain TRL level, from which changes in requirements entail rework and extension of development deadlines; and

  III. The third and final aspect involves the user feedback during the doctrinal experimentation, after the adoption and distribution of the product, aiming at the information generation for its improvement or development of new versions (KIRSCHENBAUM *et al.*, 2020; LORD *et al.*, 2019; MUDA; GOVINDARAJU; WIRATMADJA, 2020; STRAUB, 2015). The organizational structure of EB allows data collection of defense products and systems in operation, by the user, thus facilitating the acquisition of important information to support decisions to initiate new research, perform improvements of technology demonstrators and prototypes of new versions of products and systems, as well as to promote improvements and

2 Experimental or preliminary production of a relatively small product, with the purpose of adapting the prototype and testing the respective production line (BRASIL, 2016).

3 In this methodology, it is adopted that, in order to achieve TRL 6 to 9, the approved OR and RTLI are necessary. As of TRL 6, the updating of requirements must be carried out sparingly and in an agreed manner between the technical and operational parties, in order to avoid rework. In addition, it is proposed that, for a more incremental and consistent evolution of the requirements, it is planned to prepare preliminary versions of the OR and RTLI already in TRL 4 and 5, only in the requirements that are related to the critical functions of these levels.

corrections of failures and bugs of the products and systems themselves and their eventual modernizations. This aspect underpinned the **inclusion of TRL level 11** in methodology.

- **TRL calculator development:** a calculator was developed in order to establish specific steps that must be met for each TRL level, as well as to identify the type of organization responsible for the criteria for achieving certain steps, such as the Science and Technology (S&T) bodies, responsible for the preparation of the conceptual formulation, the evaluation of prototypes and pilot batches and SMEM homologation; and the general management body (ODG), responsible for the preparation of operational requirements and adoption of SMEM.

Table 4 – Summary of the TRL scale framework methodology for EB

TRL level	Description
1	**Observed and reported basic principles / theoretical modeling:** documented studies dealing with basic scientific principles, in which potential applications can be identified.
2	**Technology concept and/or application formulated:** documented studies that analyze specific applications of the object (analysis of functionalities, performance and identification of experiments).
3	**Critical function experienced and analyzed in a laboratory setting:** documented studies of experiments demonstrating the feasibility of applying the object in a high-fidelity simulated environment (specification of functionalities, performance and experiments conduction).
4	**Proof of concept validated in a laboratory environment:** critical functions of the object, implemented in a concept proof, are tested in a laboratory environment.
5	**Validated engineering model in relevant environment:** critical functions of the object, implemented in an engineering model, are tested in a relevant environment.
6	**Technology demonstrator validated in relevant environment:** critical functions of the object, including performance parameters, dimensions and weight, implemented in a technology demonstrator, are tested in the relevant environment, established in accordance with Operational and Technical Requirements.
7	**Technology demonstrator integrated into the target product validated in operational environment:** demonstrator of the technology of the object is integrated into the target product and its critical functions are tested in a first prototype version, in operating environment and according to Operational and Technical Requirements.
8	**Prototype validated in operational environment:** the target product is tested considering almost all Operational and Technical Requirements. This level represents the end of product development.

TRL level	Description
9	**Prototype evaluated by competent body (prototype evaluation):** the target product is evaluated and approved by the competent bodies of the DCT in accordance with all its Operational and Technical Requirements.
10	**Repeatability of evaluated production (pilot batch evaluation):** pilot batch evaluated and approved by the S&T bodies and adopted by ODG.
11	**Product in operation / Feedback from processed user:** improved product with flaws and bugs corrected based on feedback of the user.

Source: the authors (2022).

Note: the glossary of methodology terms can be found at **Appendix**

It is important to note that up to Level 9, the TRL scale for EB is similar to the traditional TRL scale. At these levels, customization is restricted to the criteria that must be met in each of the nine levels, as described below.

Seeking the establishment of specific steps to be fulfilled at each level of technology readiness, a calculator was developed, in a web[4] environment, by the Agency for Management and Technological Innovation (AGITEC). The tool, which can be accessed on the Army corporate network (EBNet) by the address http://intranet.agitec.eb.mil.br/calculadora, allows you to frame a technology at a TRL level after completing a maximum of 11 (eleven) questions.

Despite the expanded scope in relation to the other applications found in the literature review stage (CoPS and mass-produced products), which implied the addition of two levels to the methodology, the development process was successful in obtaining a simple procedure. Simplicity is a fundamental characteristic for the intended ability to facilitate communication between a wide range of actors regarding areas of expertise and professional experiences.

On the basis of the calculator presented by Nolte, Kennedy and Dziegiel (2003), the application follows the process in two stages: preliminary estimation and confirmation of the level of maturity. In addition, in a similar way to the IMATEC calculator of the Brazilian Space Agency (XAVIER *et al.*, 2020), the evaluation of the TRL level of a technology is carried out in relation to a particular Target Product[5].

At the stage of preliminary estimation of the maturity level, as illustrated in Figure 3, the TRL range in which the object[6] is more likely to meet: initial studies (TRL 1 to 3); develop-

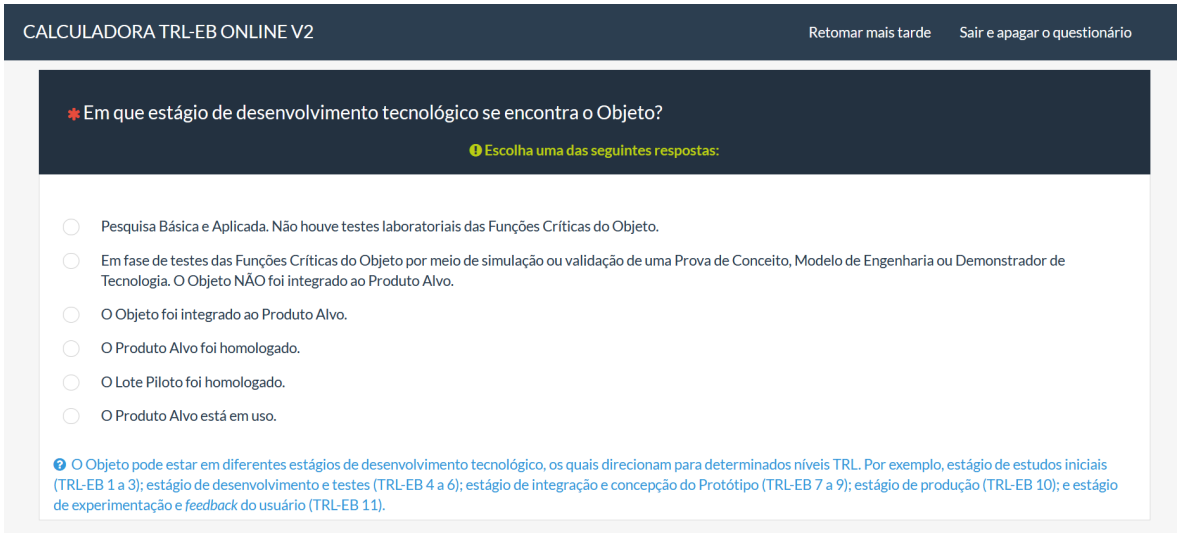
4 Name by which the World Wide Web (Internet) became known from 1991, when it became popular due to the creation of a graphical interface that facilitated access and extended its reach to the general public (OXFORD..., 2021).

5 Product or system that wants to be develop, composed of several critical and non-critical technologies.

6 "Object" refers to a critical technology, but can be represented by a system, subsystem or component (hardware or software) which, inserted in a hierarchical structure, integrates a system or product (Target product).

ment and testing stage (TRL 4 to 6); prototype integration, design and evaluation stage (TRL 7 to 9); production stage and evaluation of the pilot batch (level 10); and experimentation and user feedback (level 11).

Figure 3 – TRL ranges in which the object can be found (preliminary estimation step of maturity level)



Source: AGITEC Intranet.

In the confirmation step, the most appropriate level of the range identified from the validation of its indicators is chosen. The object is classified at the highest level in which all indicators have been met. The calculator indicators for each TRL level are summarized in Table 5.

Table 5 – Summary of indicators for each level in the TRL calculator for EB

TRL level	Indicators
1	• Definition of the basic scientific principles of the analyzed object as: formulation of laws, hypotheses, basic properties, theoretical principles or models; • Existence of potential practical applications related to the observed basic principles.
2	• Studies or industrial protection of the Object that analyze functionalities, performance and identification of experiments, for specific applications; • Definition of specific applications of the analyzed Object.
3	• Studies or artifacts of the Object that demonstrate experiments and that analyze functionalities, performance and results of experiments, for specific applications; • Demonstration of the feasibility of applications (e.g. laboratory bench or computer simulation with real data); • Identification of interfaces of the Object with other Objects.

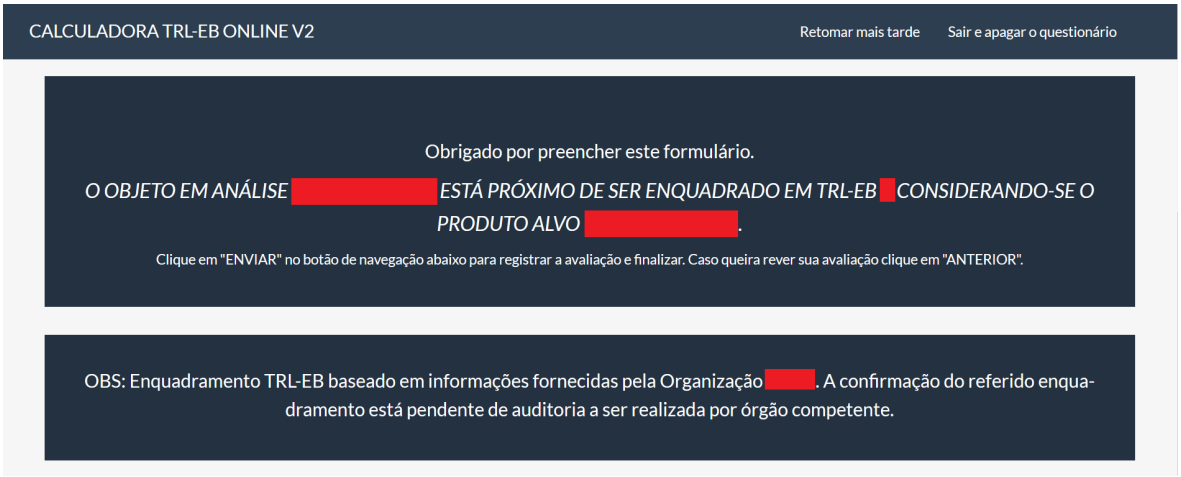
TRL level	Indicators
4	• Specification of the critical functions of the Object to be tested in a proof of concept and in a laboratory environment (laboratory environment critical functions); • Draft of preliminary OR and RTLI ; • Proof of concept test results in laboratory environment successfully validating performance and interface requirements.
5	• Specification of the critical functions of the Object to be tested in an engineering model and in relevant environment (critical functions of relevant environment); • Draft of preliminary OR and RTLI (with adjustments in relation to the version in TRL 4, if applicable); • Test results of the engineering model in relevant environment successfully validating performance and interface requirements.
6	• Specification of the critical functions of the demonstrator, to be tested in relevant environment, including those related to dimensions and weight (critical functions of relevant environment of the technology demonstrator); • COMOP, CONDOP (doctrinal and operational determinants), OR and RTLI of the target product for which the analyzed object is intended; • Technology demonstrator test results in relevant environment successfully validating performance, dimensions, weight and interface requirements, and conforming to the RTLI mapped in the relevant environment critical functions.
7	• Specification of the critical functions of the demonstrator, to be tested in the operational environment, including those that are only possible to be tested when it is integrated into the Target Product (critical operational environment functions); • Technology demonstrator test results in operating environment successfully validating performance and interface requirements and conforming to RTLI mapped in critical operational environment functions.
8	• Complete development of the target product prototype, which integrates the analyzed object, to be tested in an operational environment; • Prototype test results in operational environment successfully validating almost all absolute requirements of OR and RTLI.
9	• Prototype test results in operational environment successfully validating all OR and RTLI; • Assessment Report approved by competent S&T body.
10	• Experimental or preliminary batch of a product, relatively small, ready to be evaluated, for the purpose of testing the reproducibility of a low-scale production line; • Evaluation Report of pilot batch approved by competent S&T body; • Act of adoption of the Target Product.
11	• Doctrinal Experimentation Report; • New version of the Prototype in use, with the usage information duly implemented.

Source: the authors (2022).

Note: the glossary of methodology terms can be found at **Appendix**

After the validation of indicators in the second stage of filling, as illustrated in Figure 4, the calculator presents the TRL level in which the Object under analysis best fits, considering the associated Target Product. It should be noted that the framing carried out by the calculator is based only on the indication of documents proving the achievement of indicators for a certain TRL level. The confirmation of this framework requires an audit to be carried out by a competent body, if there is institutional interest in the technology.

Figure 4 – Framing result performed by the TRL calculator for EB



Source: AGITEC Intranet.

It is important to emphasize that the tool presents considerable maturity in terms of use within the army, given that the development process had two rounds/versions with great participation of ICT (Scientific, Technology and Innovation Institution) of EB. The calculator already counts 520 hits in its current version (Version 2).

5 Presentation and discussion of results

From the data presented, it was found that TRA based on the TRL scale is a process aimed at minimizing issues in defining the stage of technology maturation, as well as providing efficient communication between specialists, managers and other stakeholders in organizations that acquire high-tech products and systems.

With the TRL scale being the tool that underpins the entire TRA process, it was found that its customization from the perspective of a focal organization begins with the customization of the methodological framework over the TRL scale.

In the case of DCT, focal organization of a network for the development of defense technologies and products, the process of customization of the methodological framework over the TRL scale was phased in 9 (nine) stages:

1) Initial diagnosis: as presented in França Junior and Galdino (2019), it is necessary to carry out a diagnosis of the organization, aiming to identify its strengths, weaknesses, opportunities and threats; its characteristics, specificities and organizational culture; and the objectives intended with the implementation of a communication tool with the ability to standardize knowledge regarding the level of maturity of a given technology. In the DCT diagnosis, the need to customize the framework methodology on the TRL scale was identified, given that the original methodological approach did not fully meet the specifics of the organization. In this sense, two factors were pointed out as premises for the customization process:

a. Scope: broadening the product-related scope (from CoPS to mass-produced products) and focusing on communication among a wide range of stakeholders regarding areas of expertise and professional experience; and

b. Simplicity: development of a tool that is easy to access and operate and that facilitates the audit process of the evaluations carried out (FRANÇA JUNIOR; GALDINO, 2019);

2) Bibliographic review: analysis of customizations made by focal organizations that develop high-tech products and systems. In the DCT case study, the following focal organizations were analyzed: DoD (UNITED STATES, 2009), DoE(UNITED STATES, 2011), ESA (ESA, 2017), DCTA (ROCHA; MELO; RIBEIRO, 2017) and AEB (XAVIER *et al.*, 2020). As summarized in Table 1, this analysis identified two main factors for the customization of the framework methodology in the TRL scale: adaptation to the organizational culture and the development of a TRL calculator;

3) 1st Minute of the calculator: based on these two customization factors, a first draft of a TRL calculator for EB was prepared by a limited set of specialists;

4) Workshop for calculator discussion: in order to discuss the first draft of the calculator, a workshop with several experts from military organizations that work from basic research to the use of the product was held, therefore sweeping all ranges of the TRL scale;

5) New calculator (version 1): improvement of the calculator first draft from the discussions in the workshop.

6) Experimental usage in real cases: for the experimentation of the first version of the calculator, three ongoing programs were selected in the DCT, the strategic Guideline Program for the Conceptual Formulation of Armored means of the Brazilian Army (EB) (PROJETO..., 2019), the Radio Program defined by Software (PRADO FILHO; GALDINO; MOURA, 2017) and the Solo – Solo Missile 1.2 program (BRASIL, 2022). These three programs were chosen because they are in different stages of development, so their critical technologies, or subsystems, would be well distributed along the TRL scale, providing a complete analysis;

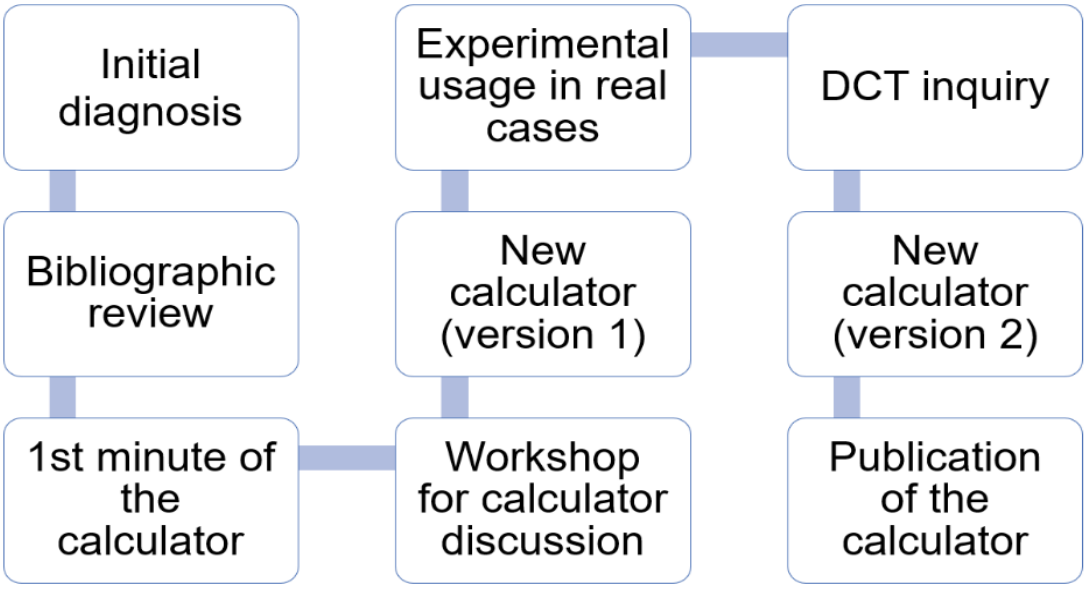
7) DCT inquiry: after the enhancement of the calculator with the workshop and with the experimental usage in real cases, a consultation was carried out within the scope of the DCT to validate the modifications;

8) New calculator (version 2): improvement of the calculator based on the information from the DCT consultation round; and

9) Provision of the calculator: finally, after the process of improvement and validation of the tool, the calculator was made available for use by the EB, accessible in the Army corporate network (EBNet) by the address http://intranet.agitec.eb.mil.br/calculadora.

The nine (9) steps of this customization process are represented in the Figure 5 diagram.

Figure 5 – Stages of the process of developing a framework methodology in the TRL scale for the Brazilian Army



Source: the authors (2022).

After providing a general overview about the customization undertaken in the EB context, it is necessary to discuss a few important points identified throughout the study.

5.1 Adherence to literature review

Firstly, the adherence of the case study to the bibliographic review should be highlighted. It was possible to verify that the two factors identified during the literature analysis – organizational culture and framework method (calculator) – were necessary and sufficient for the development of a framing methodology on the TRL scale customized for the peculiarities of the Brazilian Army.

In this context, a point that deserves attention in this paper is the description of the effort required for the development of the TRL calculator. As shown in Figure 5, this effort required nine steps and the involvement of dozens of actors. In the literature, the development effort of a TRL calculator is neither detailed nor measured.

5.2 Need for inclusion of additional levels

The adequacy of the methodology developed to the General Instructions for Managing the Life Cycle of SMEM (IG 01-018) (BRASIL, 2016) it was based on three aspects: inference capacity on the reproducibility of products produced in large quantities through pilot batch evaluation, the need for the gradual evolution of operational and technical requirements (OR and RTLI), and consideration of the user feedback during doctrinal experimentation, aiming at the improvement or development of new versions of products and systems.

Regarding the reproducibility of products produced in large quantities through pilot batch evaluation, it was possible to identify that the original TRL scale did not have this objective. The NASA R&D context is extremely complex, such as long-range telescopes or space rockets, which involves many customized components and few units produced (sometimes a single unit). These characteristics are typical for CoPS (HOBDAY, 1998), which differ from products produced in large quantities (UNITED STATES, 2020b). EB employs products of varying degrees of complexity and production volume, ranging from those produced in tens and hundreds of units, to those produced in mass. This wide range of products comprises radars, tanks, missiles, tactical radios, drones, light weapons, ballistic protective vests and ammunition. This aspect underpinned the **inclusion of TRL level 10** in the methodology, which refers to the repeatability of the evaluated production (pilot batch evaluation).

Another aspect not covered by the original TRL scale was the consideration of the user feedback. The Brazilian Army plans to take advantage of the user feedback during the doctrinal experimentation, after the adoption and distribution of the product, aiming at the generation of information for its improvement or development of new versions (KIRSCHENBAUM *et*

al., 2020; LORD *et al.*, 2019; MUDA; GOVINDARAJU; WIRATMADJA, 2020; STRAUB, 2015). The organizational structure of EB allows data collection of defense products and systems in operation (in use by the user), thus facilitating the obtaining of important information to support decisions to initiate new research, perform improvements of technology demonstrators and prototypes of new versions of products and systems, as well as to promote improvements and corrections of failures and bugs of the products and systems themselves and their eventual modernizations. This aspect underpinned the **inclusion of TRL level 11** in the methodology, which refers to the product in operation/processed user feedback.

5.3 Critical success factors

Throughout the development of a framework methodology on the TRL scale for EB, it was possible to identify two critical factors that enabled the achievement of an acceptable result to the effort undertaken: **multidisciplinary approach** and **favorable governance**.

As for the multidisciplinary approach, it should be noted that the participation of professionals from different areas of expertise (teaching, research, contracts, management, testing and evaluation, technological innovation and military doctrine) and backgrounds (military, civil servants and employees of Defense Industrial Base companies - BID) was of fundamental importance for the incorporation of different points of view in the methodology and establishment of a common communication base. In addition, the discussion and experimentation of the TRL calculator by different actors allowed the revision of its design, the removal of redundancies and the reconciliation of effectiveness with simplicity, considering that the TRL evaluation by the tool for EB is accessible (web environment) and easy operation (requires a maximum number of answers lower than that required by the calculators analyzed in the bibliographic review). Still in regard to simplicity, it should be noted that the application facilitates the audit processes, since it incorporates the indication of documents proving the achievement of indicators in the bulk of the evaluations.

In regard to favorable governance, the support of the top management of the Army Science and Technology area was crucial for the engagement of several professionals in the organization, as well as for the realization of consultation rounds that allowed the improvement of the methodology.

5.4 Generalization of the process of customization of the framework methodology in the TRL scale

From the bottom-up approach (WALDEN *et al.*, 2015), it is possible to extrapolate the customization process carried out under the DCT to a generic process to be undertaken by focal organizations that develop high-tech products and systems. This generic process can be represented by 3 (three) steps:

1) Diagnosis: carrying out the organization diagnostics, particularly in regard to its strengths, weaknesses, opportunities and threats; its characteristics, specificities and organizational culture; and intended objectives with the implementation of a communication tool that aims to standardize knowledge in respect to the level of maturity of a given technology. This diagnosis indicates two possible paths:

a. If the original approach does not fully meet the culture of the organization, the need to customize the framework methodology on the TRL scale is indicated;

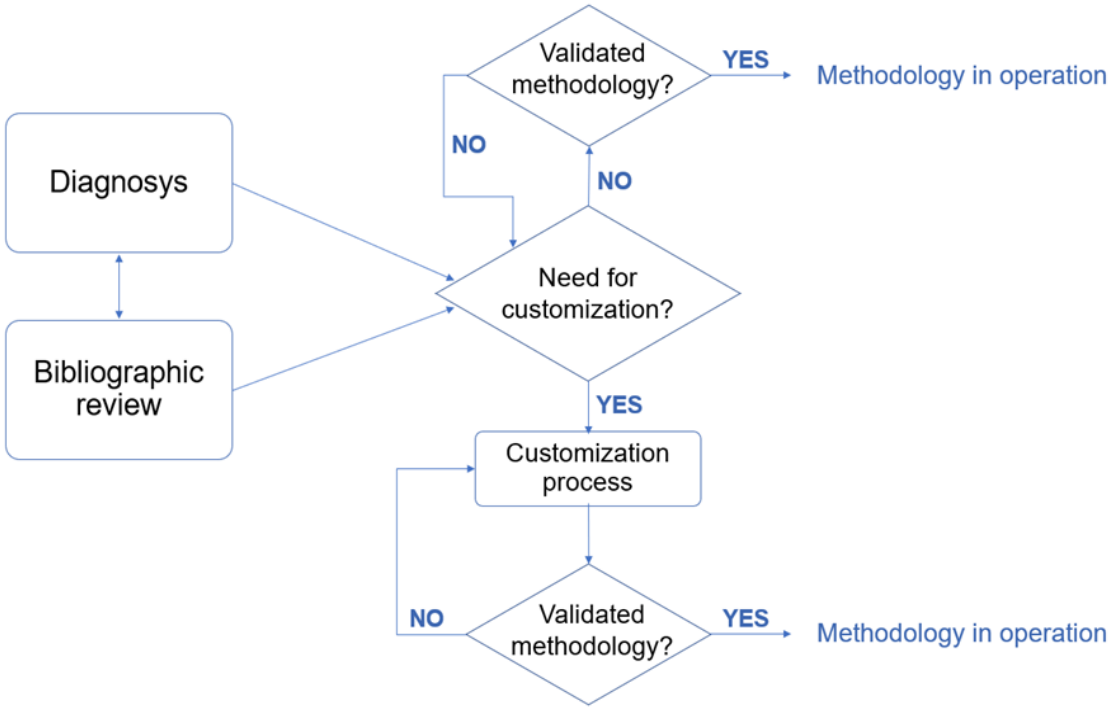
b. Otherwise, the possibility of adopting the original methodology by the organization is indicated. If necessary, minor adjustments can be made, e.g. translation and/or language adaptation;

2) Bibliographic review: in order to rectify or ratify the initial diagnosis, it is necessary to analyze processes of customization of the TRL scale undertaken by focal organizations that develop high-tech products and systems in order to understand the associated state of the art and build a comparative reference;

3) Iterative customization process: once the need for customization is confirmed, the process of developing a framework methodology on the TRL scale customized to the specifics of the organization should begin. The process is considered completed when the rounds of validation of the methodology within the organization are considered sufficient. It is suggested that the development of the methodology be accompanied by the implementation of a framework method (TRL calculator). This tool simplifies the determination of the appropriate TRL level for a technology, as well as provides repeatability and consistency to the process (UNITED STATES, 2020a). This is because non-standard assessment of the readiness stage of a technology often leads to discrepancies between the TRL level perceived by different parties involved in a project (ALTUNOK; CAKMAK, 2010; FRERKING; BEAUCHAMP, 2016; MUDA; GOVINDARAJU; WIRATMADJA, 2022; NOLTE; KENNEDY; DZIEGIEL, 2003).

The 3 (three) steps of the generic process of customization of the methodological framework in the TRL scale for focal organizations that develop high-tech products and systems are summarized in Figure 6.

Figure 6 – Generic process of customization of the framework methodology in the TRL scale for focal organizations that develop high-tech products and systems



Source: the authors (2022).

6 Final considerations

The present study revealed that the customization of the TRA based on the TRL scale is a laborious and complex process, and presented the first advances in the adaptation of the TRA to the life cycle management used by the EB (development of a methodological framework over the TRL scale).

The current scenario of specifying TRA processes is more widespread in economically and technologically developed countries, whose organizations manage to insert the maturation of critical technologies within life cycle management models and technology roadmaps of its products and complex systems (ESA, 2017; UNITED STATES, 2009, 2011).

Seeking this direction, countries with late development, as is the case of Brazil, whose high-tech demands are often not met internally, must customize the processes of TRA and systems life cycle management in order to reconcile short-and long-term strategies in obtaining and maturing critical technologies (FRANÇA JUNIOR; GALDINO, 2022).

Within this perspective, in the scope of TRA processes for the EB, the following topics stand out for future work: improvement of the life cycle management model/TRA processes with the aim of reconciling short and long-term strategies in obtaining and maturing critical technologies; definition of a method for selecting critical technologies; definition of a method

for selecting TRA staff and their role throughout the decision milestones of the life cycle; definition of methods for maturing critical technologies; and customization of the methodology framework on the TRL scale for the evaluation of components and subsystems of hardware, software and/or the biomedical field.

In a broader context, the article proposed, based on the DCT case study, a generic process of customization of the methodological framework on the TRL scale for focal organizations developing high-tech products and systems. In this generalization effort, it is also possible to approach, in future works, the use of TRA based on the TRL scale as a management and communication tool in Sectoral Innovation Systems (SIS), such as, at national level, the SIS of oil and gas and agribusiness (SCHONS; PRADO FILHO; GALDINO, 2022).

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Appendix

Laboratory environment: controlled environment that allows you to test critical functions and evaluate the performance of a particular technology, subsystem or component.

Operating environment: a real-world environment that allows the evaluation of some or all of the operational requirements specified for the evaluation of a product.

Relevant environment: a test environment that incorporates aspects of a controlled environment and a real environment, allowing simulation of critical and non-critical functions of an engineering model or technology demonstrator.

Component: most basic element pertaining to a subsystem, engineering model, or proof of concept.

Technology demonstrator: subsystem or system that represents a critical technology. It can be seen as an evolution of an engineering model and is used to demonstrate its technical feasibility in an operational environment, in order to verify the most relevant technical specifications and operational requirements of the target product. e.g. electronic circuit for encapsulated data transmission and reception , in order to allow portability, complying with previous operational and technical requirements of performance, dimensions and weight.

Scientific documentation: document containing a scientific text intended to discuss phenomena not yet fully understood. It can be published in magazines, annals, congresses, etc.

Critical functions: main functions of the evaluated object. They are the main functionalities, of a subsystem or component, to be tested for each level of technology readiness. The amount of critical functionality increases as readiness levels are achieved. In this way, each TRL level (from 4 to 7) has a set of predefined critical functions that need to be successfully tested in order to reach said level.

Critical function of laboratory environment: these are the critical functions of a proof of concept to be tested in a laboratory environment, and that must be defined to achieve TRL 4. e.g. electronic circuit for transmitting and receiving data, assembled on protoboard being powered by external power supply and processing algorithm installed in desktop computer. This proof of concept has the critical function of transmitting and receiving encrypted data. It can be tested in the laboratory without the need to evaluate transmission distance and speed.

Critical function of relevant environment: it is the critical functions that should be tested in relevant environment.

In the case of an engineering model, these critical functions must include, in addition to those specified in TRL 4, other functions that represent even more of the real system to achieve TRL 5. e.g. electronic circuit for transmitting and receiving data assembled on a printed circuit board with integrated power supply, and power antenna, and processing algorithm installed on FPGA. This engineering model has the critical function of transmitting and receiving encrypted data at a specific distance and speed. It can be tested in open field in order to evaluate not only the transmission capacity, but also its distance and speed.

In the case of a technology demonstrator, these critical functions must include, in addition to those specified in TRL 4 and 5, those related to performance, weight and dimensions, thus defining a new set of critical functions to achieve TRL 6. e.g. electronic circuit for encapsulated data transmission and reception in order to allow portability, complying with previous requirements of performance, dimensions and weight. This technology demonstrator has the critical functions of transmitting and receiving encrypted data at a specific distance and speed and being integrable into a portable communication device. It must be tested in a relevant environment in order to evaluate its performance in terms of distance, speed and transmission capacity, in addition to having viable dimensions and weight to be integrated into a communication device that is portable.

Critical operational environment function: these are the critical functions of a technology demonstrator to be tested in an operational environment when integrated with the target product, and which must be defined to achieve TRL 7. In addition to the critical functions tested in TRL 6, other critical functions of the technology demonstrator should also be considered that are only possible to be tested when it is integrated into the target product. e.g. electronic circuit for transmitting and receiving data integrated into a portable communication device. This technology demonstrator when integrated with a portable communication device, must have the same critical functions as TRL 6, that is, transmit and receive encrypted data at a specific distance and speed and have dimensions compatible with the portability of the communication device to which it will be integrated. In addition, its transmission performance must be compatible with the processing capacity of the communication device.

Pilot batch: experimental or preliminary production of a relatively small product, with the purpose of adapting the prototype and testing the respective production line.

Engineering model: an arrangement of integrated components that provides a representation of a system/subsystem and that can be used to determine the feasibility of a proof of concept. It can be seen as an evolution of a proof of concept, where laboratory components and equipment are replaced by models close to the actual subsystem so that they can be tested in the relevant environment. e.g. electronic data transmission and reception circuit assembled on printed circuit board with integrated power supply, high power antenna, and processing algorithm installed on FPGA.

Object: refers to a critical technology, but can be represented by a system, subsystem or component (hardware or software) that, inserted in a hierarchical structure, integrates a system or product (target product).

Applied research: applied research with the aim of developing technologies or techniques to intervene and alter natural or social phenomena. It can be supported by basic research.

Basic research: also called pure research or fundamental research, it is about research whose objective is the advancement of scientific theories aimed at the prediction or understanding of natural or social phenomena. It has a purely theoretical nature that intends to expand the understanding of phenomena or behaviors without, however, seeking to solve or address any problems associated with such phenomena.

Target product: product or system that wants to be develop, composed of several critical and non-critical technologies.

Intellectual property: includes patents, trademarks, industrial designs, geographical indications etc.

Prototype: first version of the target product to be produced and operated. It aims to validate all specified technical and operational requirements.

Proof of concept: an arrangement of integrated components that aims to validate a scientific concept or the main functions of a technology (critical functions). Typically this arrangement is integrated with laboratory equipment and components and "shelf" components. e.g. electronic circuit for transmitting and receiving data, assembled on protoboard being powered by external power supply and processing algorithm installed in desktop computer.

Operational Requirements (OR): document that follows the doctrinal and operational conditions in the process of obtaining an SMEM, which consubstances the characteristics restricted to operational aspects.

Technical, Logistical and Industrial Requirements (RTLI): document that arises from the operational requirements and consists of fixing the technical, logistical and industrial characteristics that the system or material must have to meet the established operational requirements.

Preliminary OR: requirements that describe only the main operational functionalities of the application (or applications) that are related to the evaluated technology. These requirements are ideally elaborated in TRL 4 and 5 and can be elaborated by the development team itself if they have basic knowledge of the user needs, or these can be extracted from technical standards. e.g. for the object "data reception and transmission module", a preliminary OR for the applications "vehicle software defined radio" or "portable software defined radio" would be: "the radio must transmit and receive text, audio and video data, maintaining a link of at least 20 km and in direct view".

Preliminary RTLI: requirements that describe only the main technical functionalities of the application (or applications) that is related to the evaluated technology and its critical functions of the laboratory environment. These requirements are ideally elaborated in TRL 4 and 5 and can be elaborated by the development team itself if they have basic knowledge of the user needs, or these can be extracted from technical standards. e.g. For the object "data reception and transmission module", a preliminary RTLI for the applications "vehicle software-defined radio" or "portable software-defined radio" would be: the radio must transmit and receive data, ensuring the transfer of 300 (three hundred) kB in a maximum of three minutes when aimed directly at a range between 20 and 40 km.

Complex Product Systems (CoPS): capital goods, systems, networks, control units, packages of software, specific, high-cost, high-tech buildings and services (HOBDAY, 1998).

Subsystem: an arrangement of integrated components that performs a certain function within a system.

Critical technology: technology pertaining to a target product that is essential to the achievement of its mandatory operational and technical requirements. It can be an unprecedented technology, or not mastered in the country, whose obtaining (acquisition or development) is of extreme priority, according to criteria of availability in the national and international market, and logistical and operational vulnerability.


ECEME

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Health Security on the Brazil–Venezuela Border: vulnerabilities and opportunities*

Seguridad Sanitaria en la Frontera Brasil–Venezuela: vulnerabilidades y oportunidades

Abstract: Emerging infectious disease outbreaks over the past 50 years reinforce the need for bioprotection capabilities at borders. Migrations of vulnerable populations have contributed to the infectious diseases spread, creating threats to the health security of affected nations. The present study investigated aspects of integrated security, bioprotection and agricultural defense on the Brazil–Venezuela border, analyzing some installed capacities and impacts associated with the migratory crisis of Venezuelans and the functioning of Welcome Operation. The research was exploratory and applied, using quantitative and qualitative techniques, with descriptive analysis. Sanitary vulnerabilities were characterized and installed capacities for agricultural defense were mapped. Finally, some strategic actions are indicated to strengthen bioprotection on the northern border and in Welcome Operation, especially greater integration in the field of epidemiological intelligence of the different agencies acting in the health security of the borders.

Keywords: health security; Welcome Operation; migrations and borders; agricultural defense; integrated security.

Resumen: Los brotes de enfermedades infecciosas emergentes en los últimos 50 años refuerzan la necesidad de capacidades de bioprotección en las fronteras. Las migraciones de poblaciones vulnerables han contribuido a la propagación de enfermedades infecciosas, creando amenazas para la seguridad sanitaria de las naciones afectadas. El presente estudio investigó aspectos de la seguridad integrada, bioprotección y defensa sanitaria agropecuaria en la frontera Brasil–Venezuela, analizando algunas capacidades instaladas e impactos asociados a la crisis migratoria de venezolanos y al funcionamiento de la Operación Acogida. Investigación exploratoria del tipo aplicada, utilizó técnicas cuantitativas y cualitativas, con análisis descriptivo. Se caracterizaron las vulnerabilidades sanitarias y se mapearon las capacidades instaladas para la defensa agrícola. Los resultados permitieron señalar algunas acciones estratégicas para fortalecer la bioprotección en la frontera norte y en la Operación Acogida, especialmente la mayor integración en el campo de la inteligencia epidemiológica de las diversas agencias que actúan en la seguridad sanitaria de las fronteras.

Palavras-chave: seguridad sanitaria; Operación Acogida; migracionesy fronteras; defensa agrícola; seguridad integrada.

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1 Introduction

In 2019, the world had 270 million migrants, that is, individuals who do not live in their countries of birth. In absolute terms, the migrant population has increased by almost 120 million since 1990. The number of migrants has remained stable over the past 60 years, about 3% of the world population. The reality of this complex phenomenon has challenged several countries and caused various impacts, mainly economic and in health (IOM, 2020).

Forced migrations due to conflicts and economic/social crises are the most critical, as they involve vulnerable populations[1]. Migrants and refugees due to wars, economic or political crises are often poor and rarely have time to plan their emigration. They tend to travel shorter distances and stay in their home region more often than other migrants. In recent periods, there have been large cumulative refugee flows, increasing the population of host countries by more than 4%. This was the case in Colombia, after the political and economic crisis in Venezuela, and in Jordan and Lebanon, as a consequence of the internal war in Syria (IMF, 2020). In 2020, the destination regions most affected by migration were Europe, with 88 million international migrants, and Asia, with 86 million (MIGRATION DATA PORTAL, 2021).

Migrations of vulnerable populations have been a vector of dispersion of infectious diseases (CASTELLI; SULIS, 2017). This study aimed to map the capacities of sanitary protection and agricultural sanitary defense in the northern border of Brazil and analyze the integrated security and impacts associated with the migration crisis of Venezuelans entering Roraima, since 2014.

The research was exploratory and applied, using quantitative and qualitative techniques, with descriptive analysis. For the open questions of the interviews, the technique of discourse analysis of the collective subject was applied (LEFEVRE; LEFEVRE, 2006).

In 2020, a bibliographic review was carried out on the key themes of the investigation (migrations, health risks, interagency operations, Operation Welcome, agricultural defense, borders, among others) in scientific databases, such as *Google scholar and Scientific Electronic Library Online* – SciELO, institutional repositories, among others.

Documentary research was also conducted in institutional reports and field collection in Boa Vista, Roraima, especially in Operation Welcome. In the field research, carried out in November 2020, visits were made to the shelters of the 5,000 Venezuelans served by the Humanitarian Logistics Task Force in Roraima - Operation Welcome and key actors linked to the health actions of the operation and agricultural defense in the state of Roraima, the Superintendence of the Ministry of Agriculture in Roraima (SFA/MAPA–RR) and the Agricultural Defense Agency of Roraima (ADERR) were interviewed. The collections were authorized by the highest authorities of these institutions and the interviewees signed an Informed Consent Form (ICF). The interviews were recorded and transcribed with the

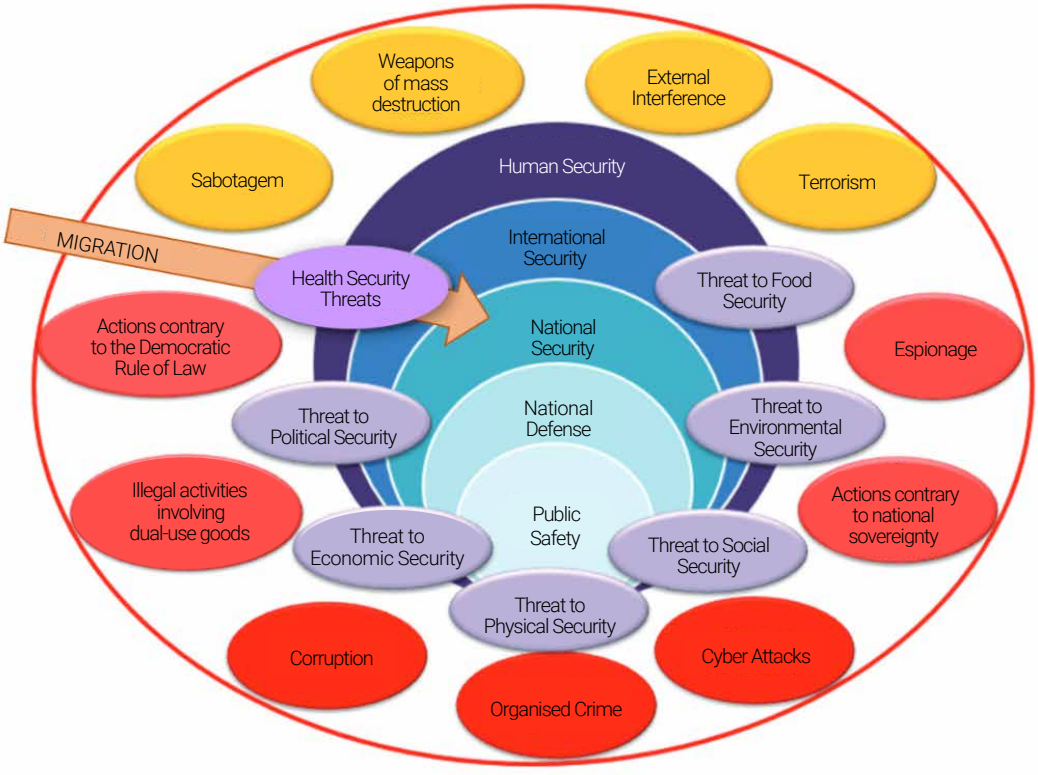
1 Population groups most exposed to poverty, disease, unemployment, violence, drug use, discrimination, malnutrition, premature death, among other risks.

TranscribeMe app (//newportal.transcribeme.com/). The data and information collected in the documentary analysis and questionnaires are presented in a descriptive form.

2 Health security and emerging and re-emerging diseases

The question of international security cannot be understood only by the absence of armed conflicts. Recent studies have established different dimensions of security, for example: a) national; b) international; c) collective; d) integral; e) human; f) democratic; g) common; h) cooperative; i) sustainable; and j) multidimensional (MARTIN, 2016). The understanding of human security goes beyond the reductionist view of protection against threats to physical security to encompass new security components, such as: economic, food, environmental, personal, health, community and political (GOUVEIA-CARVALHO, 2020; SANTOS; SILVA; GALLERA, 2020). Figure 1, below, illustrates the diverse and complex components of the expanded spectrum of multidimensional security threats in Brazil, highlighting the health threat related to the entry of migrants across borders.

Figure 1 – Broad spectrum of multidimensional security threats in Brazil

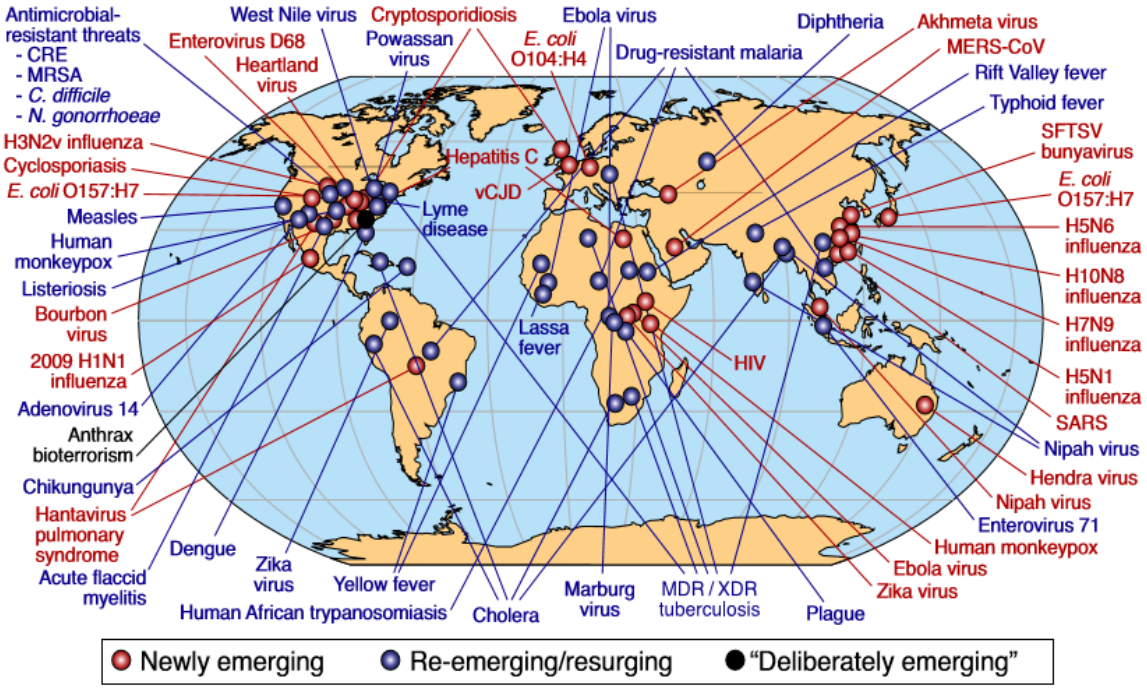


Source: adapted from Santos, Silva and Gallera (2020).

Health security essentially involves the protection of individuals and communities from disease, particularly infectious diseases. This component of Human Security assumes increasing prominence in the face of repeated outbreaks of infectious diseases, such as the COVID-19 pandemic.

The World Health Organization (WHO) has monitored the emergence of hundreds of emerging zoonoses over the past 50 years. The SARS epidemic in Asia in 2002 highlighted the vulnerability of borders to new pathogens. As a consequence, in 2005, the International Health Regulations (IHR) were reformulated, guiding the bioprotection capacities necessary to monitor, detect early and contain health emergencies of international interest. Since then, WHO has guided member countries in a global effort to train specialists, enable diagnostic laboratories, foster research into new vaccines and treatments, and promote the development of response plans to health emergencies, as recently occurred with the Ebola virus in Africa (GLOBAL PREPAREDNESS MONITORING BOARD, 2019). This mobilization is aimed at strengthening bioprotection capacities. Figure 2, below, presents the top 50 emerging and re-emerging infectious diseases that have challenged the world in the last 50 years, most characterized as zoonoses because they involve animals at source or in the transmission cycle.

Figure 2 – Emerging and re-emerging infectious diseases between 1970-2020



Source: Global Preparedness Monitoring Board (2019).

Some factors have contributed to this phenomenon of emergence and re-emergence of infectious diseases. Noteworthy are: a) biological and genetic factors (microbial adaptation

and mutations and human susceptibility to infections); b) the physical environment factors (economic development and land use and climate issues); c) ecological factors (change in ecosystems and demographic and behavioral aspects); and d) social, political and economic factors (international travel and trade, poverty and social inequality, wars, hunger, migration, refugees, lack of political will and intention to harm, in the case of bioterrorism/agroterrorism). In summary, the main determinants are globalization, environmental degradation, large population growth and humanitarian crises (KATARE; KUMAR, 2010).

The survey on the perception of risks by governments, companies and social actors, published in the World Economic Forum 2021 Global Risks Report, shows that infectious diseases represent the 5th position in the Top 10 in relation to the probability of occurring and the 1st considering the impact, in the perception of respondents (WORLD ECONOMIC FORUM, 2021).

3 Migration, Borders and Emerging and Re-Emerging Health Threats

Migration is a growing phenomenon in several regions of the world and around this complex problem are several secondary elements, one of these is the spread of infectious agents. Desai *et al.* (2020) analyzed publications between 1996 and 2016 that recorded outbreaks of infectious diseases associated with forced migrants/refugees. The authors identified, in 48 countries/territories, 128 distinct events and more than 840 thousand suspected or confirmed cases of diseases such as cholera, measles, cutaneous leishmaniasis, malaria and dengue.

Each country of origin of migrants has a set of diseases in circulation, a specific condition of the health system and a certain pattern of health and mortality, influenced by income, education, living conditions, basic sanitation infrastructure, among other factors. These health variables surrounding migrant populations are, in general, distinct from the nations receiving these vulnerable human groups (GUSHULAK; MACPHERSON, 2004).

This clash of health profiles has been responsible for the entry of new diseases in host countries and the resurgence of old diseases or controlled diseases. In the countries that received the most migrants in Europe until 2014, such as France, Germany and Italy, the proportion of HIV/AIDS and tuberculosis cases among migrants was higher than in the native population, sometimes more than double (CASTELLI; SULIS, 2017).

Between 2010 and 2020, several emerging and re-emerging diseases entered through land borders and Brazilian airports, such as Zika, Chikungunya, Measles, Mayaro, West Nile fever and COVID-19. The extension of the land border, of more than 17 thousand km, involving contact with ten countries, in addition to the intense flow of airplanes and ships, either with passengers or cargo, and demands a robust bioprotection capacity.

3.1 Health threats on the Brazil-Venezuela border in 2020

Since 2014, the social, political and economic crisis in Venezuela has triggered a serious humanitarian crisis, forcing the displacement of thousands of Venezuelan families to neighboring countries, in particular Colombia and Brazil. In 2018, the country was the main source of asylum applications in the world, with more than 340 thousand new applications. In 2019, it was estimated that 4 million Venezuelans had already migrated (OIM, 2019).

The Regional Interagency Coordination Platform2 indicates that Brazil received a total of 261,441 refugees and migrants from Venezuela, as of October 2020, among whom 145,462 had received a temporary or permanent residence permit in the country. The peak of asylum requests was in 2018, drastically reducing in March 2020, when the Brazilian borders were closed due to the COVID-19 pandemic (SILVA *et al.*, 2021). This closure caused a damming of those interested in migrating to Brazil, aggravating the internal crisis, and stimulated clandestine entry by uncontrolled routes on the porous border of Roraima with the state of Bolivar.

The Venezuelan health system has been unstructured for several years, with poor disease registration, low vaccination coverage, lack of arthropod Vector Control and low testing of diseases such as AIDS and tuberculosis (DESAI *et al.*, 2020). Between 2016 and 2018, major outbreaks of diphtheria, measles and malaria were revealed (TUITE *et al.*, 2018).

In 2016, the border state of Roraima registered an increase in the flow of Venezuelan immigrants for medical care, raising the risks of outbreaks of negligence to the Brazilian population due to the overload of the health service network. In the same year, a significant increase in imported cases of malaria, leishmaniasis, HIV/AIDS and tuberculosis was observed. The Venezuelan migratory flow in the state of Roraima favored the reintroduction of measles in Brazil in 2018, a disease considered eradicated in Brazil (BARRETO; RODRIGUES; BARRETO, 2018; MENESES *et al.*, 2019).

As of October 2019, 49,613 suspected measles cases have been reported in Brazil, with 15 deaths. This outbreak of vaccine-preventable disease was the result of the combination of two factors, the entry of the etiological agent through the Brazilian borders and the low vaccination coverage in 2018-2019, since recent vaccination campaigns did not reach the minimum protection condition with a coverage of 95% of immunized people (MEDEIROS, 2020).

In February 2018, the Brazilian federal government launched measures for emergency assistance to people in vulnerable situations due to the Venezuelan migratory flow, activating the Humanitarian Logistics Task Force in Roraima, also known as Operation Welcome, coordinated by the Ministry of Defense and integrated by multiple state actors, NGOs and international agencies. Since then, this unprecedented experience has been perfected and has become a success story (SILVA; ALBUQUERQUE, 2021).

2 The R4V platform - Response to Venezuelans is an interagency coordination of the United Nations system and civil society. Available in: https://www.r4v.info/es/node/247. Accessed: 10 Aug. 2021.

4 Borders and Agricultural Health Defense

Another component of border health security, which cannot be neglected, is protection against diseases that can cause serious damage to agriculture, with economic, social and food consequences. Brazil is seen as the great barn of the world and the share of agribusiness in Brazilian GDP reaches 30%, largely due to exports of agricultural *commodities* such as grain and meat.

If an infectious disease affects Brazilian herds, for example the foot-and-mouth disease virus in cattle, the consequences would be catastrophic, as the country is the largest global exporter of beef. The outbreak recorded in Europe, in 2001 in the United Kingdom, caused an estimated economic impact of 15 billion dollars (KNIGHT-JONES; RUSHTON, 2013). Brazil recorded its last outbreak of foot-and-mouth disease in 2006, on the border of Mato Grosso do Sul with Paraguay, taking three years to recover its sanitary *status* and resume its volume and profitability in international trade (AMARAL; GOND; TRAN, 2016).

Precariousness similar to that observed in the Public Health System of Venezuela also occurs in the Animal Health Service (*National Institute of Integral Agricultural Health* - INSAI), causing the health risks to agriculture to be unknown. According to Caetano (2017), Venezuela has 14 pests of high risk for Brazilian agriculture, with foot-and-Mouth Disease (FMD) being the most important. An important vulnerability in Venezuela is the low vaccination coverage of the cattle herd against foot-and-mouth disease, making it the only nation not recognized as FMD–free by the World Organization for Animal Health (OIE) in South America, putting the entire region at risk. In 2017, an outbreak of this virus occurred in the eastern region of Colombia, associated with the smuggling of infected Venezuelan animals (ROJAS ROMERO; ALVAREZ ESPEJO, 2019), causing an important alert on the Roraima–Venezuela border.

The entry of pathogens in the luggage of travelers crossing borders has already been characterized in the Melo researches *et al.* (2015), on clandestinely transported animal products. In the case of Venezuelan migration, this sanitary threat acquires even greater importance, since it can allow the entry of pathogens such as those that cause African swine fever, foot-and-mouth disease, brucellosis, tuberculosis, among others.

This scenario of health threats to Brazilian agriculture becomes even more relevant when outbreaks of animal diseases break out in the surrounding countries. After a catastrophic spread through Asia and Europe, African swine fever (ASF), a serious viral disease, arrived in the Dominican Republic in 2021 and the possibility of being introduced in Brazil means an important threat to pig farming. In addition to this factor, Brazil has committed, together with the World Organization for Animal Health (OIE), to suspend vaccination against foot-and-mouth disease in cattle and buffalo herds until 2026, a condition that requires, among other actions, a great reinforcement in agricultural surveillance at the borders (BRASIL, 2021).

5 Results and discussion

Each contingent of the Humanitarian Logistics Task Force (FTLH) – Operation Welcome is composed of about 600 Brazilian Army personnel who remain in Roraima for three to four months. These contingents are selected and trained by the eight Military Area Commands of the Brazilian Army.

The operation was structured to act in three aspects: a) border management, involving issues such as documentation and vaccination of migrants; b) reception with the offer of shelter, food and health care; and c) internalization, which organizes the displacement and reintegration of Venezuelans in other states (SILVA; ALBUQUERQUE, 2021).

Within the military component, structured as a large unit, there are the typical branches of the general staff, such as operations, logistics, intelligence, personnel, social communication, etc. The operation of the health cell, designated D11, is linked to the logistics function, in accordance with land military doctrine and interagency operations.

5.1 Health of military personnel and Venezuelans sheltered by the Humanitarian Logistics Task Force

Key military personnel from the 9th Contingent of Operation Welcome were interviewed, composed of military personnel from the Planalto Military Command (CMP) and the Western Military Command (CMO), consisting of 656 members who remained in Roraima from September 2020 to January 2021. In the health logistics cell of FTLH (D11), we sought to characterize the functioning of health support and the main health challenges. There is a medical unit at the FTLH main base, which operates out of barracks at the headquarters of the 1st Jungle Infantry Brigade in the military sector of the capital of Roraima, Boa Vista.

According to the Operation Welcome reports consulted, about 5,000 Venezuelans are housed in 16 migrant reception shelters, 14 of them in Boa Vista (Pintolândia, Latife Salomão, Nova Canaã, Santa Teresa, Tancredo Neves, Rondon 1, 2 and 3, Rodoviária, Jardim Floresta, São Vicente 1 and 2, Espaço Emergencial 13 Set, Pricumã) and 2 in Pacaraima (Janokoida and BV-8), in addition to the spontaneous occupations that persist. These shelters have continuous monitoring health teams from NGOs and international agencies. The D11 of the military segment of FTLH performs: a) biweekly health support in shelters (NSA); b) 24-hour emergency service; c) removal service (evacuation by ambulance to hospitals in Boa Vista, if the severity of the patient requires it); d) vaccination; and e) pre-boarding health inspection in internalization (*Fitness for travel*).

In 2020, among migrants, cases of COVID-19 and infectious diseases such as tuberculosis, syphilis, gastroenteritis and scabies stood out. In October of that year, an outbreak of COVID-19 occurred among migrants, but with a small proportion of laboratory-confirmed positive cases. The cumulative incidence among migrants, until the beginning of November 2020, reached 3% of positive (about 150 infected and 9 deaths). Field collection and documentary research revealed that many Venezuelans presented with COVID-19, but

with mild or asymptomatic presentation and did not have a confirmed diagnosis, being categorized as "suspected cases". The total casuistry indicated 617 more suspected cases, totaling a real incidence of 15% of infected migrants, with an approximate lethality of 1.3%, parameters similar to those of the population of Boa Vista.

To face the pandemic, FTLH implemented an innovative initiative the "Protection and Care Area" (APC), a kind of integration between a quarantine and a field hospital. Suspected or confirmed cases detected in the shelters were transferred with their entire family nucleus to the Protection Area (AP), where there were 250 housing units of the "modular houses" type (donated by ACNUR) ready to receive a family. In this area, up to 1,000 people could be housed, segmented into an isolation area for suspected cases (600) and an isolation area for confirmed cases (400). The protection and care area served another 11 thousand people, until November 2020, not only Venezuelans, but other foreigners and many military and civilians from the Boa Vista garrison, at a very critical moment in the pandemic[3].

Chart 1, below, lists the main causes of medical care in 2019, indicating that the main groups of diseases that commonly affect Venezuelans, before the pandemic, were respiratory system diseases (33.3%) and infectious and parasitic diseases (15.3%). This profile resembles the one identified by Van Loenen *et al.* (2018), among migrants arriving in Europe.

Table 1 – Profile of the main causes of medical care for Venezuelan migrants by the military segment of Operation Welcome, 2019

Classification of health problems (ICD-10) %	%
J00 – J99 Diseases of the respiratory system.	33,3
A00 – B99 Certain infectious and parasitic diseases.	15,3
NOO – N99 Diseases of the genitourinary system.	8,9
LOO – L99 Diseases of the skin and subcutaneous tissue.	6,8
KOO – K93 Diseases of the digestive system.	6,8
000 – 099 Pregnancy, childbirth and puerperium.	6,1
MOO – M99 Diseases of the musculoskeletal system and connective tissue.	5,3
GOO – G99 Diseases of the nervous system.	3,0
100 – 199 Diseases of the circulatory system.	2,8
F00 – F99 Mental and behavioral disorders.	2,0
Other diagnoses.	9,6

Source: the authors with data from the Humanitarian Logistics Task Force (2020).

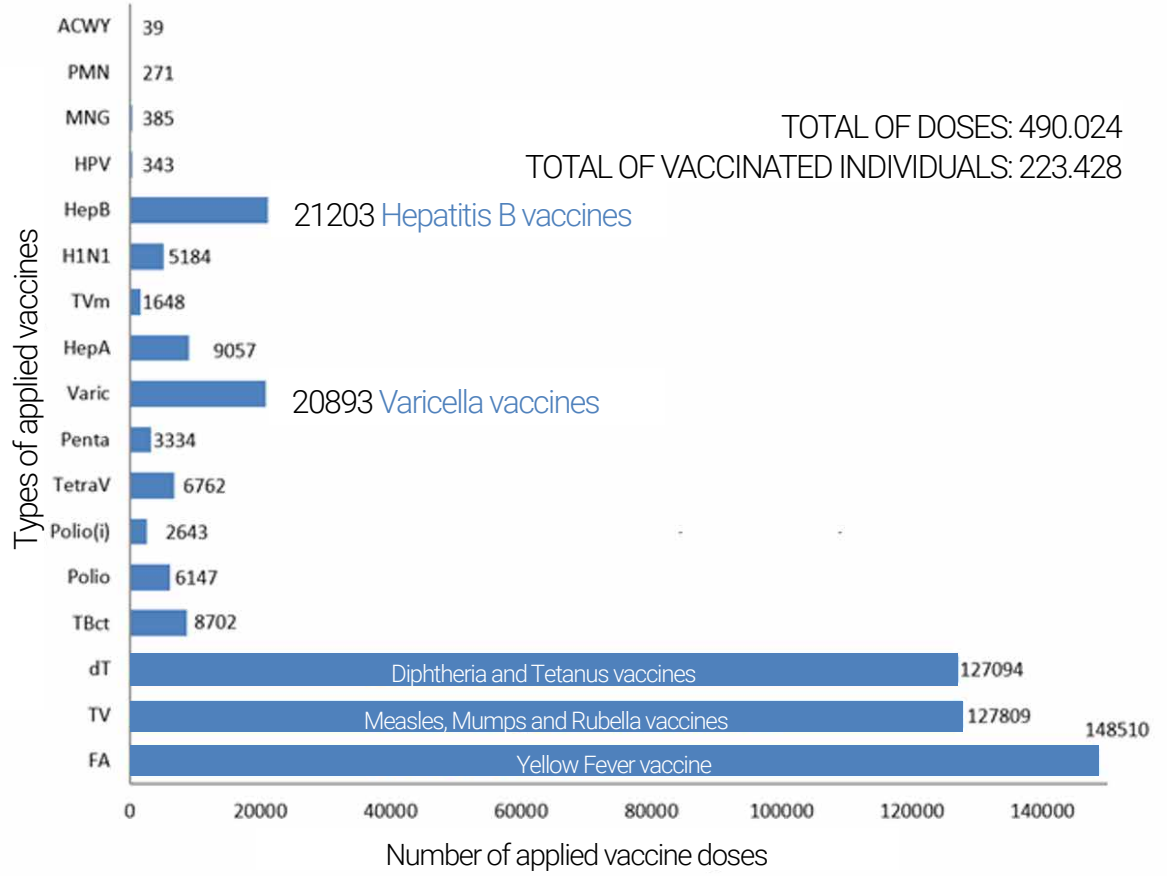
3 Data collected in the visit to Operation Welcome and in the presentations made available by the APC manager and the head of the health cell (D11), in November 2022.

5.2 Preventive and "single health" actions in the hosted operation

The APC has shown itself to be a very robust initiative to confront the pandemic, preventing the spread of the virus and promptly attending to severe cases. Operation Welcome, at its screening points in Pacaraima and Boa Vista, carries out an important preventive immunization action for adult and child migrants, who voluntarily accept immunization. At the screening point itself, the SUS (Brazilian health care system) card is issued to the migrant, so the doses of the vaccines administered are immediately entered into the Information System of the National Immunization Program, which contributes to greater control and monitoring of the vaccination coverage of this population, a very positive point observed in the Operation Welcome.

Figure 3, below, summarizes the numbers of immunized since the beginning of the operation in March 2018. This is an effective action to prevent the entry of diseases into Brazil and promote health security at the border. This measure would be even more effective if immunization upon entry into Brazilian territory were mandatory, a condition allowed by the WHO International Health Regulations (ANVISA, 2009b).

Figura 3 – Vaccines applied to Venezuelan migrants in the Humanitarian Logistics Task Force (March 2018 to October 2020)



Source: the authors with data from Operation Welcome (2020).

The Humanitarian Logistics Task Force, since 2018, has incorporated a modern practice of protecting the health of troops and migrants and provided for in the health doctrine in joint operations – the medical veterinary officer as in charge of "single health" actions, that is, health threats related to the human-animal-environment interface (BRASIL Moderna, 2017). The priority areas of activity of the veterinarian in the operation are: a) food safety; b) Water Quality Control; c) zoonoses control; d) vector control; e) pest control; f) environmental management (including effluent and solid waste management); g) veterinary clinical assistance; and h) health Intelligence (epidemiological surveillance). This important bioprotection capacity of the troops and migrants was detailed in the work of Barros and Lima (2021).

The area of responsibility of the veterinarian in the operation is wide, including the Administrative Bases of the cities of Boa Vista and Pacaraima; the immigrant care posts, including the internalization and screening post and the Reception and Care Post (PRA); 14 immigrant reception shelters, spontaneous occupations; and the military organizations that house and feed the FTLH military. Companion animals (dogs and cats) found in migrant shelters are registered, examined, neutered, vaccinated, de-wormed and accompanied. Data from the 6th Contingent, which operated in the second half of 2019, register 41 companion animals identified in shelters[4].

The activities defined in the priority axis of the operation called WASH (*Water, sanitation, and hygiene*), are essential to maintain the quality of life of sheltered migrants. These activities involve monitoring the quality of water consumed, garbage and sewage management and hygiene in the facilities, being coordinated by the FTLH veterinarian. Part of the migrants food comes from contracted firms that provide the ready-made meal, in the "quentinha" (packed-lunch) format. The veterinarian audits the process, inspects good practices and oversees the contract of the outsourced company. These activities are developed in a similar way to those conducted by the veterinarian in peacekeeping battalions deployed in United Nations missions (LIMA, 2016).

5.3 Agricultural Health defense in the context of the Brazil–Venezuela border

Key veterinary inspectors from the official state and federal Agricultural Defense Service in Roraima were interviewed. Regarding the structure of services on the Roraima–Venezuela border, an adequate structure of vehicles, equipment, resources and personnel was identified in the state agency (ADERR). Differently, in the Federal Superintendency of Agriculture in Roraima (Ministry of Agriculture, Livestock and supply – MAPA) there is a limitation of federal agricultural inspectors (only four veterinarians for the entire state) and the border posts only work during administrative hours and with mid-level technicians in routine shift/relay, closing at night. The main strategy adopted is the installation of fixed control points of the state agricultural inspections (ADERR) and federal (MAPA) in the

4 Data collected by the authors in the reports of Operation Welcome (2020).

state of Roraima, as well as in the potential access routes of pests. There are only three checkpoints on the map (in the cities of Boa Vista, Pacaraima and Bonfim), due to the acute lack of veterinary inspectors. The state agency reinforces this bioprotection network, installing mobile points on roads near the border, with 24-hour operation[5].

In addition to federal highways, there are several roads that cross the border, not asphalted, but which allow the clandestine entry of people, vehicles and products. This situation and the lack of knowledge about the real sanitary situation of the herds in Venezuela are the issues that put the Official Agricultural Defense Service on alert for the risk of pests entering Brazil.

In 2018, there was an outbreak of foot-and-mouth disease in Colombia and reports of cases of cattle with signs and symptoms by Venezuelan breeders near the border with Roraima less than 200 km from the Brazilian border[5]. These reports and the alert of the secondary outbreak registered in Colombia led to the mobilization of a rigorous sanitary barrier operation and a large vaccination campaign, in Venezuelan herds up to 500 km across the border, with immunizer donated by Brazil. These coordinated actions in conjunction with INSAI (*National Institute of Integral Agricultural Health* of Venezuela), were very effective, but unfortunately did not occur in 2019 and 2020 due to the pandemic and lack of interest from the Venezuelan counterpart[6].

A vaccination reinforcement was also triggered on the Brazilian side of the border, especially in herds located on indigenous lands and areas of difficult access, some with only helicopter support. In this last operation, carried out between April and May 2019, more than 48 thousand head of cattle were immunized in the regions of Uiramutã, Normandía and Pacaraima.

In 2020, with the closure of the border, the inspection of clandestine entries was intensified by MAPA. Contraband of large quantities of curd cheese (raw dough cheese), meat and many vegetable products were seized at mobile checkpoints on roads near the borders. In the inspection routine, integrated operations of MAPA are planned with the Brazilian Army, Federal Police, Federal Revenue Service of Brazil (RFB) and other agencies on clandestine roads on the Brazil-Venezuela border. After the border was closed in early 2020, a large volume and variety of clandestine meat products were seized on these routes. Many of these products are used by migrants to feed their families on the long journey to the interior of Brazil, until they find sources of income for sustenance[6].

5 Data collected by the authors in the reports of SFA/MAPA/Roraima (2020).

6 Data collected by the authors in interviews with the agricultural inspectors of ADERR and SFA/MAPA/Roraima (2020).

5.4 Health vulnerabilities on the Roraima–Venezuela border

It has been identified an important first health vulnerability, the absence of an epidemiological surveillance structure in the Operation Welcome. The health cell (D11) does not regularly have health professionals with expertise in epidemiology and data on the illness of migrants are not collected and monitored. In the 9th contingent of the FTLH, due to the closure of the border, a nurse officer who would stay at the screening post of Pacaraima (city on the border with Venezuela) was moved to Boa Vista and began this surveillance work.

In relation to migrants, some agencies, such as ACNUR, ADRA, Fraternity Without Borders, International Fraternity have health agents or focal point in each shelter and regularly collect data on the health of those sheltered. After analyzing these health data, the agencies request support from the military or the Roraima health department to carry out specific actions, for example, vaccinations, assistance teams, referral of cases that need special care, such as HIV, tuberculosis, malaria, syphilis, etc.[7]

It was identified the need for the health cell (D11) to maintain a closer interaction with the agencies that deal with the health data of the shelters, seeking the sharing of information. This procedure is important not only for the FTLH to have clarity about the sanitary reality and health protection in shelters under the responsibility of the military segment, but also because the troops interact regularly with the sheltered populations and after the contingent period returns to their military area commands and can be exposed to infectious diseases and disperse these diseases to other Brazilian states.

A second health vulnerability identified, in regard to health security, border and migration, was the lack of knowledge about the previous health condition of Venezuelan migrants upon entry into the country and in the Operation Welcome. As illustrated in Figure 1, the flow of migration, especially across land borders, can contribute to the entry of pathogens, causing outbreaks at the destination. No integration of Brazil with the Venezuelan health system was observed and health threats are not among the priorities of the Intelligence Cell of Operation Welcome (D2). In addition, the national legislation that regulates the treatment of refugees/migrants does not require them to be vaccinated or examined (inspection) upon arrival at the Brazilian border, allowing many to enter not adequately immunized and, sometimes, being carriers of diseases.

The vulnerability related to the lack of knowledge of the sanitary condition on the Venezuelan side of the border is also true for animal health. There are no current and reliable statistics on vaccination of Venezuelan herds, circulating diseases, outbreaks, mortality, etc. This makes it difficult to analyse the health risk at borders.

A third health vulnerability raised consists of the entry of illegal migrants through the Roraima-Venezuela land border. Several members of Operation Welcome confirmed that even after the closure of the border due to the pandemic, hundreds of Venezuelans are found in Boa Vista – RR, without documentation or any registration of entry into the country. In addition to the sanitary risk, other risks are associated with this phenomenon,

7 Data collected by the authors during visits to shelters and interviews with members of Operation Welcome, in Roraima (2020).

since this type of entrance is completely uncontrolled. Through this illegal route, live animals and contaminated food can also enter, putting Brazilian agriculture at risk.

A fourth health vulnerability was characterized by the deficient agricultural defense structure of MAPA in Roraima, especially the lack of tax authorities. The fragile installed capacity of agricultural health surveillance at borders, ports and airports has already been characterized in the ANVISA survey (2009a), in which it was indicated that less than 40% of these entry points had the minimum conditions to monitor, detect, respond and communicate the risk of health threats. Several weaknesses in the actions implemented by the International Agricultural Surveillance System (VIGIAGRO) were pointed out in an audit carried out by the Federal Court of Accounts (BRASIL, 2012B). The aforementioned court of accounts made important recommendations, especially the need for MAPA/VIGIAGRO to act in the border strip in an integrated manner with the other inspection bodies, components of the Border Protection Program.

5.5 Integrated Health Security, lessons learned in the context of Operation Welcome and the Brazil–Venezuela border

Security and defense in Brazil are structured to face multiple threats, as illustrated in Figure 1. The protection of society involves an integrated security strategy, understood as broad-spectrum measures, involving, in addition to external defense, civil defense, public security and economic, social, educational, scientific-technological, environmental, health and industrial policies, as defined by the National Defense Policy (BRASIL, 2012a).

The results of this study indicate gaps in the field of intelligence, either due to the lack of knowledge of the health threats present on the Brazil-Venezuela border, or due to the precarious epidemiological surveillance of human and animal diseases. Another point that stands out is the lack of integration between actors from the health field in the Operation Welcome, such as doctors, veterinarians, nurses, health agents from NGOs, members of the D11 cell, among others. This same lack of integration and information sharing is observed among human health and agricultural defense agents, as well as with other tax authorities and institutions operating at the border, such as the Federal Police, ANVISA, Brazilian Federal Revenue, Brazilian Army, etc. These findings characterize a lack of integration between the agencies responsible for health security at the border, characterizing several vulnerabilities. Measures are needed to securitize the border in the field of bioprotection, with measures already tested and approved in similar situations, such as at European borders (BENGTSSON; RHINARD, 2019).

After analyzing the scenario and health vulnerabilities, the following opportunities are listed to strengthen health protection at the Roraima-Venezuela border and contribute to integrated security:

a) sharing epidemiological information;

b) training of intelligence personnel for interagency operations, leveling the minimum knowledge on biosecurity, bioprotection, sanitary security and agricultural defense;

c) displacement of technical personnel and agricultural auditors to the border either by tender, assignment of technical personnel from other ministries (for example, selection of temporary Veterinarian Officers from the Brazilian Army for this specific mission in support of MAPA; remuneration and career progression incentives for tax inspectors who remain at least two years at the border, etc.);

d) conduct modeling studies on the risk of disease entry through the northern border, as well as estimate the financial impact of the possible entry of foot-and-mouth disease and African swine fever originating in Venezuela;

e) activate an epidemiological intelligence unit in Operation Welcome to record and monitor the evolution of diseases in the troops and migrants, conducting constant risk analysis and building predictive scenarios;

f) create in the head of logistics of the Ministry of Defense a Health Surveillance Center, responsible for the selection and appointment of veterinarians for the contingents of the Operation Welcome, as well as guiding the training and performance of these specialists, in order to allow continuity and memory of the collective health data of the operation. This same center would serve to coordinate the actions of troop health protection, food defense and epidemiological intelligence in all joint operations and peacekeeping missions with Brazilian contingents; and

g) conduct studies on the integrated border security model adopted in developed countries in Europe and North America, aiming to define the most appropriate model for the Brazilian reality, which may be the creation of a National Integrated Border Security Agency, responsible for the governance of the current Integrated Border Protection Program (PPIF), which works under the Coordination of the Institutional Security Office (GSI), a strategic body that performs various and complex missions.

6 Final Considerations

The emergence of infectious diseases and migration are phenomena that have worsened recently. This study investigated aspects of health security in the northern border of Brazil, more specifically in the region of Roraima, the border between Brazil and Venezuela. The installed bioprotection capacities and the impacts associated with the migratory crisis of Venezuelans entering Roraima since 2014 were analyzed. The health routine of Venezuelans sheltered by the Humanitarian Logistics Task Force in Roraima – Operation Welcome was characterized. The structure and actions of the agricultural defense in Roraima were investigated. It was characterized by some circulating diseases at the border, potential health threats to the troops, to the Brazilian population and to agriculture. Four health vulnerabilities arising from behaviors or deficiencies in the installed capacities of epidemiological surveillance and agricultural defense were mapped.

The results allow us to indicate some strategic actions to securitize the border region in focus. To strengthen health security at the northern border and bioprotection in Operation Welcome, the importance of integrating intelligence between the various agencies operating at the border and in Operation Welcome, as well as in agricultural defense, is highlighted.

This study had some limitations, among them access to few epidemiological data, procedures, protocols recorded on the sanitary aspects studied at the border and in the Operation Welcome. It should be noted the scarce bibliography and the rare studies that have integrated aspects of public health and agricultural health defense in the border area. Due to time and resource limitations, the bioprotection capacities linked to the agencies of the Ministry of Health and the State Secretariat of Health in Roraima, as well as ANVISA and the Ministry of the environment, were not investigated

As future work, it is suggest follow-up studies on the constructs discussed, such as detailed monitoring of the health of migrants, troops components of Operation Welcome, international agricultural surveillance and related actions. Investigating the actions and structures linked to the federal and state health sector will be relevant to complete the mapping of bioprotection capacities in the Brazil-Venezuela border region. Modeling studies on the risk of diseases entering the northern border and estimating financial impacts will be important subsidies for decision-making and prioritization of aspects of epidemiological intelligence, health intelligence and integration of border security actions.

Authorship and collaborations

All authors participated equally in the preparation of the article.

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Territorial walls and migration control in Italy and Greece during the humanitarian crisis in Syria (2015-2018)

Muros territoriales y controles migratorios en Italia y Grecia durante la crisis humanitaria de Siria (2015-2018)

Abstract: Syrian refugees encountered enormous difficulties in accessing the countries in which they intended to seek asylum, due to the impeditive measures adopted by them, characterized as true walls, contrary to the provisions of the main international conventions on the subject. These international conventions aim to guarantee rights and protection to refugees, of which the principle of *non-refoulement* (non-return) stands out, which determines that the refugee will not be returned to their country of origin. With this, the following question arises: how did the migratory barriers imposed by Italy and Greece affect the principle of *non-refoulement*? This work aims to analyze the Italian and Greek policies during the years 2015 to 2018 and if they did not violate the concept of *non-refoulement* by preventing the entry of asylum seekers. In this sense, the article uses the qualitative method, especially based on a document analysis of the policies of the two countries, as well as a case study methodology to argue that the *non-entrée* mechanisms, used by Italy and Greece, started to prevent formal recognition since it would only materialize with access to the territory of these countries.

Keywords: refugees; *Non-Refoulement*; Syria; Italy; Greece.

Resumen: Los refugiados sirios encontraron enormes dificultades para acceder a los países en los que pretendían buscar refugio, debido a las medidas impeditivas adoptadas por ellos, caracterizadas como verdaderos muros, en línea con lo dispuesto en los principales convenios internacionales en la materia. Estas normas internacionales tienen como objetivo garantizar los derechos y la protección de los refugiados, de los cuales se destaca el principio de *non-refoulement* (no devolución), que determina que el refugiado no será devuelto a su país de origen. Con esto, surge la siguiente pregunta: ¿cómo afectaron las barreras migratorias impuestas por Italia y Grecia al principio de *non-refoulement*?Este trabajo tiene como objetivo analizar las políticas italiana y griega durante los años 2015 a 2018 y si no violaron *a priori* el concepto de *non-refoulement* al impedir la entrada de solicitantes de asilo. En este sentido, el artículo utiliza el método cualitativo, especialmente a partir de un análisis documental de las políticas de los dos países, así como una metodología de estudio de caso para argumentar que los mecanismos de *non-entrée*, utilizados por Italia y Grecia, comenzó a impedir el reconocimiento formal ya que solo se lograría con el acceso al territorio de estos países.

Palavras-chave: refugiados; *Non-Refoulement*; Siria; Italia; Grecia.

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1 Introduction

Migrations are part of the history of human evolution and have occurred, and still occur, for various reasons. Initially, human beings migrated in search of their food security, but over time, with the organization of society, people began to migrate due to political or religious persecution or because they fled conflicts, seeking their physical integrity.

In Classical Antiquity, the search for refuge became a political topic for the first time. It is from ancient Greece the origin of the word "asylum", which arises from the junction of the particle "a", which for the Greeks denoted denial, with the word *asylao,* its meaning would be the same as to withdraw or extract. Thus, the Greek word *asylon* meant the protection of people who sought shelter in other cities for any reason, including persecution (ANDRADE, 2001).

From the fifteenth century there is news of the expulsion and forced migration of a large number of people, a movement that began with the Jews of the region of present-day Spain, in 1492, an expulsion that occurred for religious reasons as a result of the Christianization policy of the kingdom of Castile and Aragon (JUBILUT, 2007. Most Jews took refuge in Portugal (CUPERSCHMID, 2003; RODRIGUES, 2016).

In addition to the Jews, the same kingdom expelled Muslims, nationals of the Ottoman Empire, rival of the Iberian States in the Mediterranean, on charges that they threatened military security if they protected their nationals living outside its borders. Also based on the religious argument, and because they did not adhere to the official religion, there was the expulsion of Protestants from the Netherlands, between 1577 and 1630. There are also Huguenot Protestants, fugitives from France in 1661, at which time King Louis XIV imposed the religious conversion of the population to Catholicism. Finally, there was the expulsion of Puritans, quakers and Irish Catholics from England in the eighteenth century in the name of imposing religious unity on Britain (JUBILUT, 2007).

The effects of the 1st and 2nd World Wars, in regard to large population displacements, ended up generating a great commotion in the International Community. In this way, they normalized, within the framework of Public International Law and the Universal Declaration of Human Rights, the actions and measures to be carried out to safeguard the lives of people who felt compelled to leave their homeland.

To this end, the United Nations High Commissioner for Refugees (UNHCR) was established under the aegis of the newly established United Nations (UN) in 1950 to deal with refugee affairs. As a result of this creation, the Convention Relating to the Status of Refugees was established in 1951, which established, among several provisions, the principle of *non-refoulement*, being that, the cornerstone of protection for refugees.

In 1967, a protocol was created that reformulated and provided more scope to that established in the Convention, since the statute of 51 protected refugees who emerged as a result of World War 2, in Europe. However, from the 1960s, the various emancipationist conflicts

that occurred, mainly in Africa and Asia, resulted in a large number of refugees, causing the international community to revise the recommended in the 1951 Refugee Statute.

In its definition, *non-refoulement* it is a principle that prohibits states from returning a refugee or asylum seeker to territories where his life or freedom, as well as his other fundamental rights, are under threat of violation on grounds of race, religion, nationality, belonging to a particular social group or political opinion. As described, this principle is what guides all the other provisions inserted in the statute and legal texts.

However, although there is an evolution of International Refugee Law in the Twenty-First Century, some European states have been adopting measures to control the migratory flow, through border barriers, especially in recent years. Thus, individuals who are at risk are not even able to formalize a request for refugee *status* in the country of destination, thus demonstrating the violation of this principle by the signatory states to the 1951 Convention and its 1967 Protocol. From the above, this article aims to analyze the territorial walls and migration control in Italy and Greece during the Syrian humanitarian crisis during the years 2015 to 2018.

Despite the fact that there are no world-wide conflicts, such as the Great Wars, which have generated forced migratory movements in large quantities, the world continues to be plagued by civil wars, terrorist actions, natural disasters and regional exoduses. These facts occur due to food shortages, among other reasons, which cause people to seek better living conditions in other countries. However, faced with a scenario, in recent years, of growing nationalism in several countries of the world, in order to reaffirm their sovereignty and in the face of various demonstrations of xenophobia that have occurred in European countries and the global north, many states are imposing territorial barriers and are intensifying their migration controls, not allowing refugees to enter their territories and be protected by the provisions of the Refugee Statute and its protocol. This raises the following question: How did the migration barriers imposed by Italy and Greece affect the principle of *non-refoulement*?

This article is divided into three sections, other than an introduction and a conclusion. The first section will address theoretical and conceptual aspects of International Refugee Law, the principle of *non-refoulement* and the main international conventions on the subject.

Next, the causes and consequences of the Syrian crisis since the Arab Spring will be addressed. In addition, the main impacts of this crisis will be discussed, especially the departure of nationals from that country to the most different regions, including Europe.

The third section will discuss the main policies and restrictive measures regarding the arrival of Syrians in Europe between the years 2015 and 2018, focusing especially on those adopted by Italy and Greece. The article concludes with an opinion on these entry barriers and the consequent violation of the principle of *non-refoulement*, a cornerstone of the protection of internationally recognized refugees.

2 Refugee Protection Instruments

2.1 Definition of refugee in the 1951 Convention

The legal regime for the protection of refugees began to develop in the early 1920s, shortly after the Bolshevik Revolution, and the league of Nations introduced its concern for forced migrants (JUBILUT, 2007). The first period of the Refuge Institute, between 1920 and 1935, defined refugees collectively, that is, because they were part of a certain social or ethnic group and needed protection.

Still with the bias of protecting a specific group, in 1938, the Intergovernmental Committee on Refugees (IGCR) was founded, with the purpose of protecting and assisting Jewish refugees from German countries (SIMÕES, 2018). According to Hathaway (1991, p. 25): "since 1938, the institution of refuge receives a more individualistic approach, having as its main characteristic the examination regarding the merit of each asylum seeker. This period is comprised between 1938-1950".

With the end of the Second World War, there was an extreme need to create a well-structured international legal base related to the refugee issue, given that this was the historical event that gave birth to the largest number of people fleeing evidenced yet, generating more than 40 million refugees (BARRETO, 2010).

According to the United Nations High Commissioner for Refugees:

> The United Nations Convention Relating to the Status of Refugees was formally adopted on 28 July 1951 to resolve the refugee situation in Europe after World War II. This global treaty defines who becomes a refugee and clarifies the rights and duties between refugees and the countries that foster them (BARRETO, 2010, p. 10).

The 1951 Convention, conceived in the midst of the Cold War, was an international legal instrument capable of defining the term "refugee", as well as specifying their rights and duties. The report was the result of the *Ad Hoc* Committee efforts on Statelessness and related problems, established by the United Nations Economic and Social Council (ECOSOC) in 1949.

The text handled in the 1951 Convention was approved at the United Nations Conference of Plenipotentiaries relating to the Status of Refugees and Stateless Persons, of July 28, 1951, coming into effect on April 22, 1954, bringing in its Article 1 (A), the following definition of Refugee:

> 1) Who was considered a refugee under the adjustments of May 12 1926 and June 30 1928, or the conventions of October 28 1933 and February 10 1938 and the protocol of September 14 1939, or the Constitution of the International Refugee Organization;

> 2) Who, as a result of events that occurred before January 1, 1951 and fearing persecution on grounds of race, religion, nationality, social group or political opinions, is outside the country of their nationality and who cannot or, by virtue of that fear, does not want to avail themselves of the protection of that country, or who, if they do not have nationality and are outside the country in which they had their habitual residence as a result of such events, cannot or, due to that fear, do not want to return to it (BARRETO, 2010, p. 11).

Moreover, the legal provision brings its exceptions not applying to persons in whom there are serious reasons to think that they have committed some crime against peace, war crime or crime Against Humanity. In relation to those who have committed a serious crime under common law outside the country who have sought refuge, before being admitted as refugees in that country, and, finally, to those who have become guilty of acts contrary to the purposes and principles of the United Nations (Convention Relating to the Status of Refugees, 1951).

> Due to a more immediate vision of the members of the convention, the concept of refugee was restricted to people who had been persecuted or displaced as a result of the events prior to the date of January 1, 1951, creating the temporal and geographical reserves. However, the concept became comprehensive through the 1967 Protocol Relating to the Status of refugees (SIMÕES, 2018, p. 99).

Thus, the Convention Relating to the Status of Refugees of 1951 and its protocol of 1967, as well as the United Nations and its agencies have established that enjoy the refugee *status*:

> People who are outside their country of origin due to well-founded fears of persecution related to issues of race, religion, nationality, belonging to a particular social group or political opinion, as well as due to serious and widespread human rights violations and armed conflicts. (UNHCR, 2022)

It should be noted, however, that the term "persecution" has not been conceptualized by international norms, in which the individual must have founded fear of persecution to be defined as a refugee. It should be noted that, for international regulations, victims of natural disasters or famine are not covered, unless, in addition to these factors, these victims also have a well-founded fear of persecution, according to the reasons set out in Article 1 (A) of the Convention Relating to the Status of Refugees. In addition, for Jubilut (2007), the reasons established in the Convention Relating to the Status of Refugees and in the 1967 Protocol are directly related to civil and political rights guaranteed at the international level and that, in the case of the refugee individual, are not being respected.

2.2 The Principle of *Non-Refoulement*

The Global Trends 2021 report (UNHCR, 2022), published annually by the UN Refugee Agency, points out that in 2021, more than 82 million people worldwide were forced to leave their homes. Among them, 48 million people were considered internally displaced, 26.4 million refugees and 4.1 million asylum seekers. According to the aforementioned document, in 2020, more than 30 thousand people a day were forced to flee their homes due to conflicts and persecution.

The world is facing the worst migration crisis since the Second World War, with a sharp increase in forced displacement. For Luis Varese in article for IMDH, 2005

> The Cartagena Declaration becomes strategic at a time when the nature of armed conflicts is changing rapidly, when increasingly anarchic conflicts occur or to assert a group identity. The most tragic of the new faces of war are the levels of violence and, above all, violence against the civilian population, the affirmation of sexual violence as a weapon of war, which has always existed, and which has now been elevated to the category of military tactics, to demoralize and establish social control. Conflicts between states, which can be internationally obliged and responsible, no longer prevail, conflicts of armed groups that often resort to generalized violence and atrocity crimes to assert their power or local control took place (VARESE, 2005, *online*).

There are numerous existing conflicts that lead the individual to displacement, such as the Syrian Civil War, the historical conflict between Palestine and Israel, the Libyan Civil War, the humanitarian crisis facing the Rohingya group in Myanmar, conflicts in the Middle East, the fight against the Islamic State, Civil War in South Sudan, political conflicts in Venezuela, among other relevant events. As rightly discussed by Bauman (2017, p. 11):

> What has happened in recent years, however, is a huge jump in the contingent of refugees and asylum seekers, added to the total volume of migrants already knocking on Europe's doors; this jump has been caused by the growing number of "sinking", or already submerged, States, or – for all intents and purposes – stateless, and therefore also lawless territories, stages of endless tribal and sectarian wars, mass murder and permanent banditry of the "every men for himself" type. To a large extent, this is collateral damage from the military fatally misjudged, poorly conducted and calamitous expeditions to Afghanistan and Iraq.

The principle of *non-refoulement* is protected by Article 33 (1) of the 1951 Convention, the Magna Carta for refugees. Within the framework of International Refugee Law, this principle is the guarantee that the refugee individual and asylum seeker must not be compulsorily returned to any territory where there is a possibility of violation of human

rights, armed conflict, persecution and widespread violence. It must be said, therefore, that this norm deals with a negative obligation imposed on states, which cannot endanger the life of the refugee person, and must prevent sending them to the territory where they may be exposed to threats and violations (MARQUES, 2018).

For International Human Rights Law, the return seal is treated as an implicit obligation of peremptory seals, such as the prohibition of torture and inhuman punishment or treatment, being broader and giving protection to every person, without differentiation. For International Refugee Law, the purpose of the person (*ratione personae*) of *non-refoulement* is linked to refugee *status*, including those who are awaiting recognition of *status* as well. While International Humanitarian Law understands that transfers or deportations of the protected individual during times of occupation or armed conflicts are prohibited (MARQUES, 2018).

Jubilut (2007) clarifies that the *non-refoulement* is the basis of Refugee Law, which gives that person protection, reception, a new country and opportunity to live, as well as, starting from this principle of human solidarity, a system of public law has been built. Thus, it is a negative obligation, considering that it is the function of the state not to expose the refugee to the risk of persecution or violation of human rights, and should refrain from sending that individual to the territory where their life or freedom may be at risk (MARQUES, 2018).

As for the positivity of the principle of *non-refoulement* within the framework of international law, it can be said that:

> It should not be overlooked that the widespread adoption of *non-refoulement* obligations in human rights treaties has strongly contributed to the improvement of the international protection of migrants. In this sense, it is possible to identify a myriad of human rights treaties – universal and regional – that proscribe refoulement, implicitly or explicitly, inter alia: International Covenant on Civil and Political Rights (1996); United Nations Convention Against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (1984); International Convention for the Protection of All Persons from Enforced Disappearance (2006); European Convention on Human Rights (1950); American Convention on Human Rights (1969); OAU Convention on Refugees in Africa (1969); Inter-American Convention on Extradition (1981), Inter-American Convention to Prevent and Punish Torture (1985); African Charter on Human and Peoples' Rights (1981); Convention on the Rights of the Child (1989); Charter of Fundamental Rights of the European Union (2000); and the Arab Charter on Human Rights (2004) (Marques, 2018, P.47-49).

As elucidated by Marques (2018), the term "*non-refoulement*" is used as a form of obligation that encompasses not only repulsion at borders, but also other forms of compulsory departure that make it possible to expose the refugee to the risk of persecution.

For Marques (2018), it is extremely relevant to face the relationship between articles 33(1) and 1 (A) (2) of the 1951 Convention, regarding the dimension *ratione personae* of the obligation of non-return. Whereas Article 33 (1) only refers to the expulsion of the refugee to the borders of territories where his or her life or liberty is threatened, the principle of *non-refoulement* also protects the refugee who seeks refuge. The *non-refoulement* principle does not differentiate between the refugee and the one waiting for the refugee *status* declaration.

In this same sense, Luz Filho (2001, p. 11) formulated the following understanding:

> Provided for in Article 33 (1) of the Geneva Convention Relating to the Status of Refugees of 1951, the principle of *non-refoulement* is essential to the international protection of refugees and prohibits the receiving state from applying any measure of compulsory departure that directs the refugee to the territory where he or she suffers, or may suffer, a threat or violation of his or her fundamental rights as a result of persecution, torture or cruel, inhuman or degrading treatment or punishment, including the prohibition of refoulement against the asylum seeker who intends to remain under its jurisdiction. The principle has scope, therefore, on the territory of the state, its borders and international areas that give them access.

For Marques (2018), when a state does not have the capacity to guarantee the protection of refugees, that same state should look for alternatives so that the safety of these refugees is guaranteed, not returning them to the country of origin, but to a country that manages to absorb them and that can guarantee their protection and safety.

In this same sense, Luz Filho (2001), presents that refugee protection does not only occur through the formalization of their *status*, but with the granting of the guarantees and rights to the applicants, including in these guarantees the principle of *non-refoulement*.

Despite the international effort to guarantee protection to refugees, there are some gaps in the bookkeeping of the *status* that end up giving room for interpretation. In these loopholes, the States end up preventing the entry of asylum seekers, as Oliveira well observed:

> However, the aforementioned article 33 (1) of the 1951 Convention does not explicitly mention the application of the *non-refoulement* to refugees not yet formally recognized, nor to the prohibition of their rejection at the border. In this sense, the practice of states to impose border barriers to the access of asylum seekers involves the discussion of issues related to the scope of application of such a principle and admission at the border, given the right of sovereign states to safeguard their territories (OLIVEIRA, 2017, P. 31).

In the following section, we will address the Syrian crisis in order to better understand how these displacements occurred and then seek to understand the reasons for the indicated European states (Italy and Greece) to have adopted restrictive policies that, in practice, violated the principle of *non-refoulement.*

3 The Syria Refugee Crisis

3.1 The Arab Spring

The Arab Spring was a series of popular uprisings that broke out in more than 10 countries in the Middle East and North Africa region. Tunisia was the cradle of revolutions that spread to neighboring nations in opposition to high unemployment rates, poor living conditions, corruption, and authoritarian governments (CASARÕES, 2012).

These movements in search of democracy are still a consequence of the independence of the African colonies, which when they freed themselves from their metropolises ended up being directed by authoritarian minorities who managed to seize power. However, the quest for democracy would come at a heavy price, and bloody episodes first emerged in Africa and spread across the Middle East.

Visentini (2012) brings in detail one of these episodes: "on December 17, 2010, the young Tunisian, Mohhamad Bouazizi set fire to his own body as a form of protest against the oppression and corrupt government of his country". This act of desperation can be considered the fuse of the Arab Spring. Giving greater detail to the event, Fernando Brancoli brings us the following passage:

> [...] for the seventh time in two weeks, a police officer confiscated the vegetable stall of a young Tunisian, Mohamed Bouazizi. On the last occasions he had been seized, he was only released on payment of bribe. When trying to retrieve the items again, the seller allegedly received a slap on the face, given by an agent, who, in addition to physical aggression, used phrases to humiliate the Tunisian's father, who was killed when Bouazizi was three years old (BRANCOLI, 2013, p. 45-46).

Brancoli (2013) brings us some historical and geographical information about Syria, reporting that it was one of the last countries to join the Arab Spring protests, being located in a central region of the Middle East, to becoming independent from France in 1946 and bordering Lebanon, Israel, Iraq and Turkey.

The author complements his ideas by addressing the internal Syrian environment, pointing out that the country was experiencing instability in the political and economic fields that eventually reverberated in the psychosocial field, in which the level of unemployment was high, there was a lack of access to drinking water and great restriction of fundamental rights through a government.

The Syrian case is shrouded in great complexity. The religious issue, with the presence of elements of Islamic fundamentalism, added to international interests and geopolitical disputes in the region, means that the conflict that began in 2011 has no prospect of reaching an end (BRANCOLI, 2012; CASARÕES, 2012).

The dictator Bashar Al-Assad, who remains in power due to the unrestricted support of Russia, violently suppressed the demonstrations that took place in Syria, starting a civil war that lasts to the present day. This conflict is responsible for a large number of refugees and is a sensitive and relevant issue on the agenda of the international community.

3.2 The Syria Refugee Crisis

When the conflict in Syria began in 2011, a large number of people began to leave the country, since the conflict was not only political, but also involved disagreements between local ethnicities and religions. An unprecedented civil war broke out that violated international humanitarian law, including the use of chemical weapons in urban areas, disproportionate attacks on urban and civilian areas, and targeting ambulances, water treatment plants and markets. Too often destruction seems to be the goal as basic standards of humanity are ignored (International Committee of the Red Cross, 2018).

According to UNHCR, as early as March 2011, around 5,000 Syrians crossed the border into Lebanon, marking the beginning of the largest humanitarian and forced displacement crisis the 21st century has witnessed to date. Also during this period, other countries in the region began the first actions to welcome Syrian refugees. Turkey, for example, opened its first refugee camp in May – and is now the most welcoming country in the world for Syrians (UNHCR, 2021).

Continuing the search in the UNHCR website, it is possible to see that at the end of 2012, neighboring countries, of course, were the ones that sheltered Syrian refugees the most, with about half a million refugees. This number would continue to grow, since the conflict and crisis were just beginning and reached the level of two million refugees in the first half of 2013.

With no end in sight for the conflict, Syrians continued to leave their country, but in search of a safe place. But neighboring countries have lost the ability to take in new refugees, becoming overwhelmed. Lebanon welcomed about 2500 refugees a day in April 2014 (UNHCR, 2022).

Syrian refugees face unimaginable difficulties as they try to reach safety. Syrian displaced tell sad stories of displacement as they leave their homes, fear of the harsh winter, lack of water, food and electricity. The options are cruel: buy food or warm up from the cold. Many cannot afford to pay for both at the same time (International Committee of the Red Cross, 2018). Many of these stories have become true tragedies, mainly because of the various shipwrecks that occurred when refugees were trying to reach Europe through the Mediterranean Sea.

It is noteworthy that these tragedies began to stamp various international media outlets, which made the eyes of the world turn to the conflict. In this way, several humanitarian aid agencies began to make efforts to mitigate Syrian suffering while waiting for a solution to the internal issues of the country.

UNHCR (UNHCR, 2022) still brings some considerations about the *spill over* from the Great Syrian displacement: "other countries in the region began to mirror the meager socio-economic conditions plaguing Syria and, as a consequence, around 500,000 Syrian refugees embarked on Sea trajectories towards Europe."

In 2016, after five years of conflict, the war in Syrian territory remained responsible for the largest humanitarian and refugee crisis in the world. It is estimated that in that year, more than 2 million internally displaced persons and members of affected communities sought protection services inside Syria.UNHCR, 2022).

The European Border and Coast Guard Agency, known as FRONTEX, was established to help EU Member States and associated countries in the Schengen Area to protect their borders, including cross-border migration control and crime (FRONTEX, c2021b).

Corroborating the data collected by FRONTEX, it is estimated that more than one million migrants arrived in Europe in 2015 via the Mediterranean Sea (FRONTEX, 2021). Of this total, more than eight hundred thousand went to Italy and more than one hundred and fifty thousand went to Greece. According to the FRONTEX report, this significant number is a consequence of the stagnation of the war in Syria and the poor quality of life in refugee camps.

Due to this serious crisis in Syria and without the prospect of a close closure, a large number of migrants have sought refuge in other countries, logically passing through their neighbors, but seeking Europe as their final destination. However, despite all the mishaps encountered in this pilgrimage, which highlights a dangerous crossing in precarious boats towards Europe, the countries of the Old Continent did not expect them with open arms.

Syrian refugees would also have to face the migration policies implemented by European countries that, for the sake of their sovereignty and internal security, would hinder their entry, and their long-sought security, through policies known as *non-entrée.* Among these countries, Greece and Italy stand out, which will be the subject of study in the next section.

4 Italy and Greece migration policies between 2015 and 2018

The countries most sought after by refugees were Italy and Greece, probably because of their proximity to the Middle East and North Africa. The access routes used were the Mediterranean and Aegean seas. However, these destinations sought by Syrian refugees, demanded a sea crossing. Many of these crossings ended up killing thousands of refugees before they reached their destination (UNHCR, 2022).

The European Union is an economic and political union consisting of 27 countries, which share policies in various fields such as climate, health, security and migration (UNIÃO EUROPÉIA, 2021). At the height of the Syria humanitarian crisis, the UK was part of the EU. Within the European Community, the Schengen area was established, which would be an area that allows European and non-European citizens to move freely through the countries

that are part of that area, eliminating the internal borders that exist between them. However, the EU began to strengthen the control of external borders in order to guarantee the security of those who live or transit through this area (UNIÃO EUROPÉIA, 2021).

The refugee crisis has shaken some rules in force in the EU, and one of them is the recognition of a refugee *status* of a person, since the asylum request must be made in the country where the applicant enters the bloc, which comes to burden countries such as Italy and Greece, which are the largest refugee recipients in the bloc.

Concurrently with the Syrian humanitarian crisis, Italy and Greece were still suffering from the effects of the 2008 global economic and financial crisis, which led to poor economic performance and rising unemployment.

In this way, the arrival of refugees, in the long term, caused xenophobic sentiment to arise and gave precedents to the emergence of policies aimed at making it difficult for asylum seekers to enter these countries. Within the proposed by the study of this work, the policies adopted by Italy and Greece that were intended to hinder or prevent the entry of refugees from the humanitarian crisis in Syria will be addressed in the next sections.

4.1 Migration policies of Italy between the years 2015 and 2018

Housing immigrants who enter a country in large numbers is no easy task. There is an obvious overload in the political, economic and social fields that end up impacting the lives of the residents of these countries. In this sense, Fernandes (2018), raises two types of impact in the economic field: direct and indirect. The direct refers to the expenditure spent on the shelter and aid of immigrants. Within this direct impact, Fernandes brings us that Italy has spent about 5 billion euros to be able to receive, shelter and assist these immigrants. Complementing his idea, he states that the indirect impact reaches, in addition to the economic field, the social field, since migrants accept jobs for lower wages, lowering wage levels and increasing the unemployment rate of Italian citizens (FERNANDES, 2018).

Still, following the reasoning of Fernandes (2018), the arrival of refugees brought to Italy, in the political field, a great polarization. Due to the economic situation, which was not one of the best, coupled with an increase in unemployment rates and lower wages, many Italians began to support far-right candidates who used anti-immigration policies in their campaigns.

Deepening in data the economic crisis experienced by Italy, while the number of immigrants increased in its territory, Davanzati and Giangrande (2019) bring us the following data about the Italian economy:

> Since 2008, GDP growth has always been below 2% per year. In the period considered, there was a severe recession, the lowest point of which was in 2009, with a drop of -5,5%. Thus, there was a hesitant recovery in 2010 and 2011, respectively of 1.7% and 0.6%. In 2012 and 2013, GDP fell again expressively. From 2014 onwards, the performance was lackluster, with slow GDP growth (DAVANZATI; GIANGRANDE, 2019, p. 10).

The information provided by the scholars, coupled with the entry of a high number of Syrian refugees into Italy since the beginning of the crisis in their country, which indirectly impacted on the Italian economy, made Italians seek to believe that the economy would recover if the entry of immigrants was prevented (FERNANDES, 2018).

http://brasil.elpais.com/tag/italia/a Italy, which was going through an economic crisis and which suffered from the constant arrival of immigrants in its territory, sought help from the European Union to try to alleviate this situation that did not seem to have a close outcome. However, having ignored their pleas, the Italian state decided to restrict the entry of boats with immigrants into its territory, since it did not have the conditions to absorb the intense migratory flow that had Europe as its final destination (A PIOR..., 2017).

As measures to repel immigrants, in 2017, Italy cut the route through Greece and Turkey, but remained the main gateway to Europe, since migrants began to use Libya as a starting point to cross the Mediterranean (G1, 2018).

In this way, due to the whole conjuncture of the Italian state, Matteo Salvini ascended to power, who had as a campaign the fight against immigration in Italy:

> In 2018, even with the significant reduction (-75%) of migratory flows, the coming to power of the league of Matteo Salvini – leader of the Italian extreme right – took place through an electoral campaign based on xenophobic discourse and abusing fake news associating migrants with crime and unemployment, stimulating hatred and intolerance in the country, in a typical scapegoat production tactic (CARDOSO, 2020, *online*).

While in power, 2018-19, Salvini established measures that ignored the international conventions to which Italy was a part of. It began to prevent ships with migrants from docking in Italian ports, triggering FRONTEX to direct them to another country (CARDOSO, 2020). This caused the suffering of the Syrians to be prolonged in time, starting to encourage irregular crossings that were conducted by coyotes in boats without security. Thus, in addition to risking their lives, immigrants arrived at their destination without money, depending on the support of the state that welcomed them.

In response to the measures created by Salvini , 451 migrants were transferred from a fishing boat to the FRONTEX Mediterranean border patrol vessels, directing them to Malta or Libya.

The decrees bearing Minister Salvini's name severely limited visas for humanitarian reasons, reduced the scope of the protection system for immigrants, and established social danger as a reason for expelling a asylum seeker (SALVADOR, 2021). It should be noted that these decrees had the approval of the Council of Ministers and the consent of the population. In addition, according to Salvador (2021, p. 34) "the decree formalizes to the Minister of the Interior the right to restrict and prohibit the entry, transit or landing of ships in Italian territorial waters for reasons of order and security, framing the facilitation of irregular immigration as an aggravated infraction".

Salvador (2021, p. 32) also brings to light the reason for the elaboration of the decrees by Salvini: "[...] justifies the decree – both in its preparation phase and when already approved -to eradicate cases of immigrants arrested on charges of connection with terrorism, promote order in cities and 'guarantee justice' to Italians".

The climate that prevailed in Italy, in which the economic situation was critical and with high unemployment, made Italians point to refugees as another of the factors responsible for the serious crisis that the country was going through. In this way, the environment became conducive to the rise of far-right politicians to power and, consequently, the implementation of measures that would curb the entry of refugees into the country.

3.2 The migration policies of Greece between the years 2015 and 2018

The 2008 crisis also rattled Greece. Together with Portugal, Italy and Spain, he became a member of PIGS (Portugal, Italy, Greece and Spain), a group of countries that had their economy shaken and in full decline within the European Union.

In order to strengthen itself economically, Greece signed three bailout agreements, as Falcari and Niemeyer bring us (2018, p. 39):

> Since the 2010 crisis, Greece has signed three bailout agreements. The first, on May 3, 2010, totaling € 107 billion, of which € 72.8 billion was disbursed until March 2012. The remainder was suspended to be included in the second bailout. This, signed on March 1, 2012, involved in addition to this inclusion, € 130 billion to be disbursed between 2012 and 2014. The third, in July 2015, involved € 86 billion to be disbursed between 2015 to 2018. In none of these three agreements, despite pressure from the IMF, was debt relief contemplated. On the contrary, the imposition of austerity measures on the country was the common denominator.

As in Italy, the economic crisis has been accompanied by high unemployment rates and, in parallel, it has also been one of the most sought-after destinations for Syrian refugees fleeing the crisis in their country.

Living the serious economic crisis, already in 2012, Greece built, with the intention of reducing the flow of immigrants to its territory, 12 km of fences on its border with Turkey (SERVIÇO PASTORAL DE MIGRANTES, 2012), in addition to installing a surveillance circuit, according to the United Nations observations on the Greek asylum system:

> Towards the end of 2012, an electronic surveillance system was introduced on the Greece-Turkey land border, and a 12 km fence effectively prevented any attempt to cross that part of the land border that is not marked by the Evros River.

> These measures have resulted in a shift in land crossings to sea borders in the northern and northeastern Aegean Sea, making the journey of migrants and refugees more dangerous, with a number of shipwrecks in which dozens of people have lost their lives at sea. The victims are mostly Syrians, Afghans and Somalis. The Hellenic coastal Court numbered 218 search and rescue actions (involving 6,421 rescued people) during the first seven months of 2014 against a total of 110 in the full year of 2013 (2,511 rescued people)[1] (UNHCR, 2014, p. 7).

Still, as reported in the UN observations document, the Greek government has implemented detention measures outside the EU land and sea borders, with the purpose of discouraging irregular crossings, smugglers and coyotes:

> The Greek authorities acknowledge that they have implemented containment measures at land and sea borders outside the EU, with the intention of discouraging irregular crossings before they occur. The imposition of law and order by the Hellenic Coast Guard also targeted smugglers and facilitators of irregular migration[2] (UNHCR, 2014, p. 7).

After the installation of *non-entrée* on the part of the Greek state, the United Nations High Commissioner for refugees came to the following data:

> In all, according to police statistics, 29,894 people were intercepted and arrested at the Greece-Turkey sea border during the first nine months of 2014, compared to 8,052 people during the same period of 2013, while arrivals at the Evros land border continue to remain low since the end of 2012. The overwhelming majority (more than 91%) of those who arrived in 2014 were Syrians, Afghans and Eritreans[3] (UNHCR, 2014, p. 7).

A migration agreement between Turkey and the European Union in 2016 would use the former as a buffer state, curbing the migration flow towards Greece (WENDEN, 2016). In this way, the EU would prevent Syrians from entering European territory and prevent migrants from making the pilgrimage through the Schengen area after being granted guaranteed asylum.

1 Towards the end of 2012, an electronic surveillance system was introduced along the Greek-Turkish land border, and a 12 km fence completed, effectively hindering any crossing at this part of the land border not marked by the river Evros. These measures have resulted in a shift from land crossings to sea borders in the North and South-Eastern Aegean Sea, making the journey of migrants and refugees a lot more perilous, with a number of shipwrecks in which dozens of persons have lost their lives at sea. Victims were mostly Syrians, Afghans and Somalis. The Hellenic Coast Guard counted a total of 218 search and rescue (SAR) incidents (involving 6,421 rescued individuals) during the first seven months of 2014 against a total of 110 in whole year of 2013 (2,511 persons rescued).

2 The Greek authorities acknowledge that they implement deterrence measures at the external EU land and sea borders, aimed at discouraging irregular crossings before they occur. The enforcement of law and order by the Hellenic Coast Guard also targets smugglers and facilitators of irregular migration.

3 In all, according to police statistics, 29,894 persons were intercepted and arrested at the Greek-Turkish sea borders during the first nine months of 2014, in comparison to 8,052 persons during the same period in 2013, while arrivals at the land border of Evros continue to remain low since the end of 2012. The overwhelming majority (up to 91 per cent) of those arriving in 2014 were Syrians, Afghans, Somalis and Eritreans.

According to Dr. Thomas Gammeltoft-Hansen of the Danish Institute for Human Rights, this practice adopted by the EU and Turkey is called *non-entrée,* in which poor countries serve as "*gatekeeper*" of the most developed countries:

> [...] this growing set of *non-entrée* practices as a critical case for examining the continued role of international law in refugee policy. Over the last two decades, many of the traditional *non-entrée* practices have been legally challenged. Rather than abandoning *non-entrée*, states have instead turned their attention to a new generation of deterrent regimes intended to overcome these legal objections. Much, if not most, of the work of deterrence is now taking place in the territory – or at least under the formal authority of – poorer states of origin and transit, which for economic, political or other reasons are often willing to serve as the gatekeepers to the developed world[4] (GAMMERLOFT-HANSEN, 2014, *online*).

In this same sense, Castiglione published in the Public Health notebook, in 2018, the following:

> From there, the so-called "No-Entry" regime was consolidated. Since many of the initial practices of this regime have been legally challenged - and condemned - over the past decades, several of the so-called developed countries have come to dodge these defeats by 'outsourcing' their border control policies. The latest generation of policies is anchored in the territories around Europe and focuses on containing refugees - and migrants - in their regions of origin or in transit countries, through increasingly intensive collaboration with countries such as Turkey or Libya. For this, several strategies are mobilized: prison construction, technical assistance, technology transfer, among others. Such policies shape the path one must travel to obtain asylum. Keeping these paths in mind when talking about the health of the refugee population is essential, since many of the health risks and outcomes are related to the spaces, times, and institutions that make up the "No-Entry" regime: countries of origin and transit, the border, the countryside the "asylum office", sometimes the detention center or deportation (CASTIGLIONE, 2018, p. 1).

The study carried out by the European Parliament came to the following conclusion on the situation of refugees in Greece:

> In *Greece* too, persons of foreign origin *xenoi* increasingly monopolize discussions in the media in a negative perspective. Following the EU–Turkey Statement on 18 March 2016, the general welcoming attitude began to change. Terms such as

4 [...] this growing set of *non-entrée* practices as a critical case for examining the continued role of international law in refugee policy. Over the last two decades, many of the traditional *non-entrée* practices have been legally challenged. Rather than abandoning *non-entrée*, states have instead turned their attention to a new generation of deterrent regimes intended to overcome these legal objections. Much, if not most, of the work of deterrence is now taking place in the territory – or at least under the formal authority of – poorer states of origin and transit, which for economic, political or other reasons are often willing to serve as the gatekeepers to the developed world.

> 'migration' 'and' migrants 'instead' of 'refugees' reappeared in the terminology used by political leaders and other influential actors, thus suggesting that the country does not bear the same legal obligations as for refugees[5] (EUROPEAN PARLIAMENT, 2017, p. 80)

Similarly to Italy, the study concluded that xenophobia has become prevalent among Greeks:

> The concentration of refugees and migrants on the islands is increasing tension there, as thousands of asylum seekers have begun to realize that they have been "trapped", while local communities have begun to realize the difficulties in dealing with the situation and its impact on day-to-day life and tourism. The media report on a number of attacks against small groups of refugees on the islands, the ill treatment of unaccompanied minors in places of detention, as well as attacks against humanitarian staff and accommodation sites[67](EUROPEAN PARLIAMENT, 2017, p. 80).

Similarly to Italy, Greece, which was experiencing serious economic instability, came to adopt measures that prevented or hindered the entry of refugees (SERVIÇO PASTORAL DOS MIGRANTES, 2012). The Greek population supported the measures adopted by the government, since they believed that the entry of a high number of refugees was responsible for the crisis they were going through, which brought to the surface the feeling of xenophobiain the country.

5 Final Considerations

The humanitarian crisis in Syria, which began in 2011 with the Arab Spring, triggered a large migratory movement of Syrians in search of better living conditions. Following a natural itinerary, they first moved to the countries that make territorial limits and later moved on to other destinations such as Europe.

5 In **Greece** too, persons of foreign origin *xenoi* increasingly monopolize discussions in the media in a negative perspective. Following the EU–Turkey Statement on 18 March 2016, the general welcoming attitude began to change. Terms such as 'migration' 'and' migrants 'instead' of 'refugees' reappeared in the terminology used by political leaders and other influential actors, thus suggesting that the country does not bear the same legal obligations as for refugees.

6 The concentration of refugees and migrants on the islands is increasing tensions there, as thousands of asylum seekers started to realize that they were 'trapped', while local communities started to note the difficulties in the management of the situation and its impact on daily life and tourism. The **media report on a number of attacks** against small groups of refugees on the islands, the ill treatment of unaccompanied minors in places of detention, as well as attacks against humanitarian staff and accommodation sites.

7 In **Greece** too, persons of foreign origin *xenoi* increasingly monopolize discussions in the media in a negative perspective. Following the EU–Turkey Statement on 18 March 2016, the general welcoming attitude began to change. Terms such as 'migration' 'and' migrants 'instead' of 'refugees' reappeared in the terminology used by political leaders and other influential actors, thus suggesting that the country does not bear the same legal obligations as for refugees.

Because they are developed countries, with greater potential to provide a better quality of life, Syrians have sought as a destination countries such as Italy and Greece. It should be noted that once entering these countries and having *status* as a ratified refugee, these migrants could move throughout the European continent that is encompassed by the Schengen Area.

However, Italy and Greece have sought to prevent Syrian refugees from reaching their territories, through territorial barriers such as fences, and by stepping up land and sea patrols, through agencies such as Frontex, the European border and Coast Guard Agency. However, by adopting these mechanisms, it is not possible to distinguish refugees from irregular immigrants, which prevents the refugee from having their rights guaranteed.

In parallel to the humanitarian crisis in Syria, Italy and Greece were experiencing a serious economic crisis, creating barriers to absorb the high number of asylum seekers entering their territories, making them unwelcome in their countries and generating a strong xenophobic feeling and support for ultranationalist policies by the population that felt harmed by the entry of immigrants.

Although Greece and Italy are part of the United Nations, and accept the provisions of the International Declaration of Human Rights and the Status of Refugees, there is no international norm that obliges states to guarantee refuge and accept refugees in their territories.

The recognition of refugee *status*, and access to their rights, such as that of the *non-refoulement,* as already mentioned, it is a mere formality, since the refugees in fact already finds themselves in this situation. In this way, the mechanisms of *non-entrée,* used by Italy and Greece, began to prevent this formal recognition, since it would only materialize with access to the territory of those countries.

In order to avoid the practices of *non-entrée*, although there is no obligation to admit refugees into their countries, the principle of *non-refoulement* should already be admitted beyond the borders of the countries of destination.

It is also inferred that barriers, both physical and actions that prevent access to a territory, end up becoming a violation of the principle of *non-refoulement* for denying the request in the destination country.

The present study did not intend to exhaust itself or give a solution to the issue, since it is a complex issue in which it contrasts state sovereignty and human rights, however, in cases in which there is the involvement of refugees, who leave their countries due to fear and in order to ensure the right to life, it would be necessary for the UN, through UNHCR, to have more powers and autonomy before national States so that it could manage crisis situations more efficiently and that it could guarantee the rights and mitigate the suffering of people who find themselves in this situation of vulnerability.

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