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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.

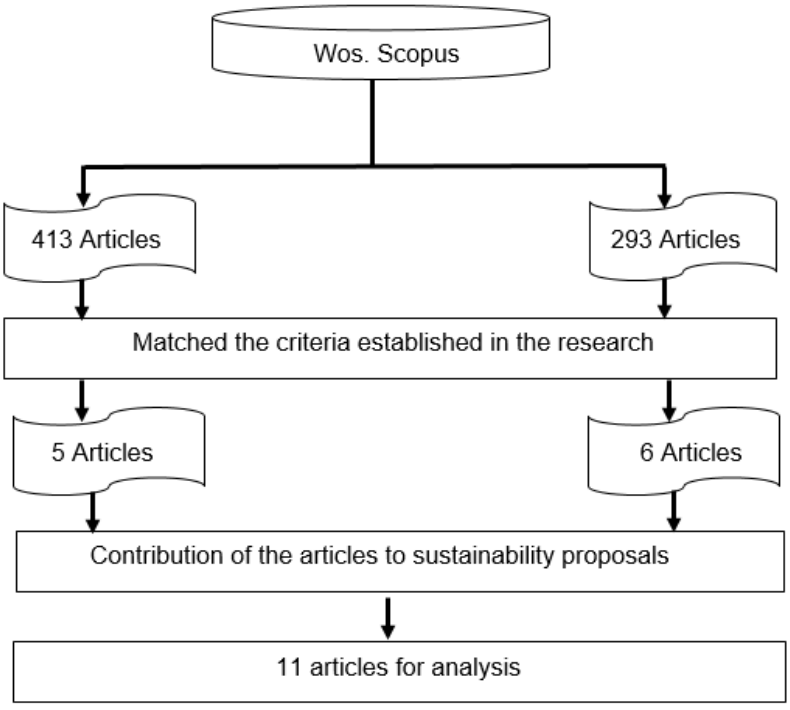
The analysis of the quality of the selected articles was carried out from a view conditioned to the common aspects evidenced in each research, namely: objectives and relevant and positive results, in addition to their publications being in management/environmental journals, and Journal of high concept 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).

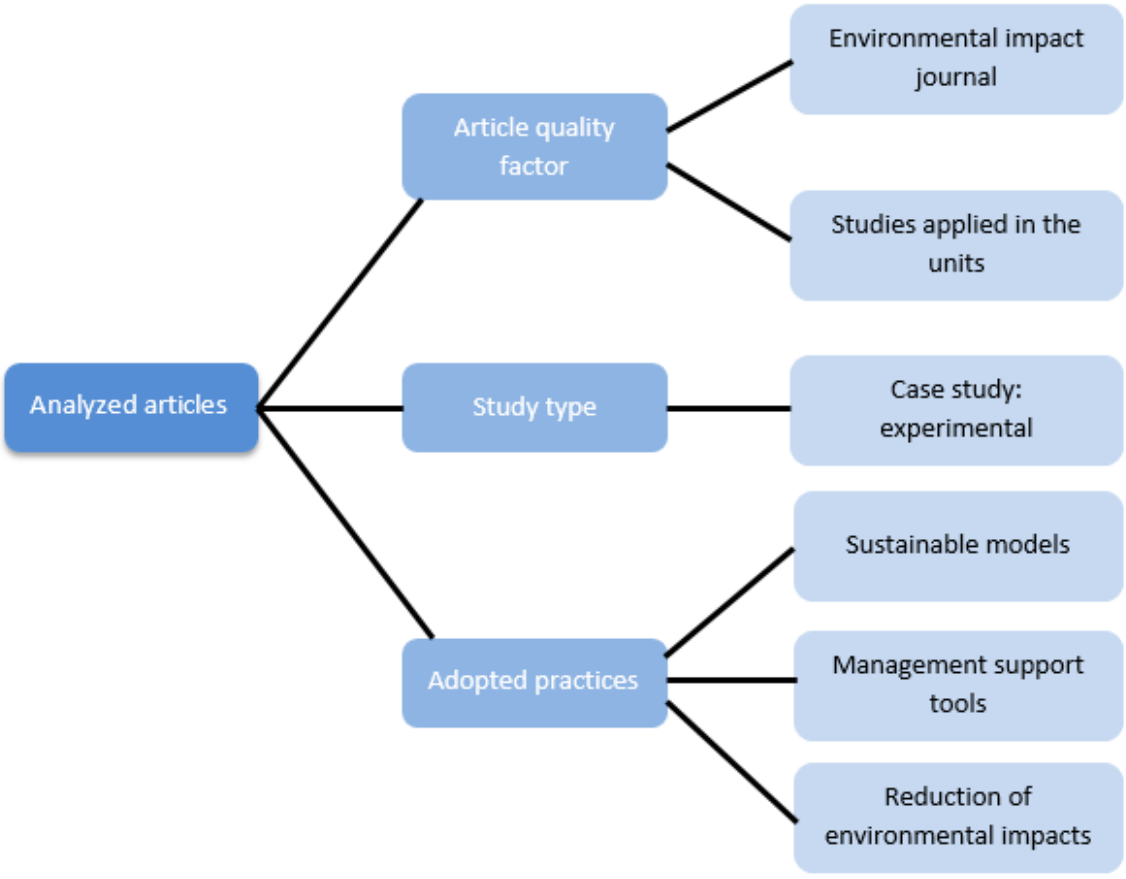
Table 1 – Management Proposals Prepared by the Armed Forces

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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