Impacts of climate change on the preparation and use of the Armed Forces

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Executive summary

Ongoing climate change impacts the planet globally, significantly affecting the security of nation-states. These changes result from human actions, particularly those leading to greenhouse gas emissions. This reality reverberates through the strategic and operational planning of the armed forces and is reflected in high-level security and defense documents of several countries.

Concerning Brazil, the effects of climate change are related to the following factors: increased temperature, decreased rainfall, intensification of the dry season, sea level rise and coastal flooding, alteration of the rainfall regime, and intensification of extreme weather phenomena.

Such changes and their consequences impact in a complex and diverse way the missions of the armed forces around the world, causing effects of multiple orders. Six different perspectives affect the missions of the armed forces: (1) the debate around the role of the forces as a relevant actor in the emission of greenhouse gases; (2) the budget dispute, since the public resources necessary for measures to mitigate the effects of climate change are large; (3) the direct effects of climate change on areas, facilities and equipment of the armed forces; (4) the increased use of the armed forces in civil defense missions; (5) the possibility of engagement in humanitarian missions under the aegis of multilateral organizations, in areas affected by natural disasters; and (6) the possibility of engagement in high-intensity conflicts, due to geopolitical disputes against the background of environmental issues.

From the analysis of these perspectives of impact on the armed forces, the present work makes the following recommendations to the Brazilian Defense Sector.

- Expand studies so that, ahead of time, operationally appropriate solutions can be put forward for the Forces to adopt. These could include the adoption of alternative forms of energy production and the adoption of solutions in Military Engagement Systems and Materials that contribute to the country's effort to achieve its goals of reducing greenhouse gas emissions;

- Prepare for a budget dispute increasingly impacted by government investments committed to mitigating the effects of climate change;

- Adopt measures that increase the resilience of areas and facilities under military administration, as well as Military Engagement Systems and Materials, in the face of extreme weather events;

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- Maintain the preparation and readiness of troops to act in humanitarian aid operations in a joint and interagency environment, in the context of operations in support of Civil Defense, in national territory;

- Maintain the preparation and readiness of troops to act in humanitarian operations under the aegis of multilateral organizations in a joint and combined engagement environment abroad;

- Maintain the preparation and readiness of troops to act in defense of the homeland, in high-intensity operations, and in the maintenance of sovereignty and national interests within a framework of instrumentalization of the climate issue.

KEYWORDS
Climate Change; Armed Forces, Security; Defense.

1. Introduction

Ongoing climate change impacts the planet globally, with significant repercussions on the security of nation-states. Such changes are the result of human action, especially those that result in greenhouse gas emissions. This is a reality that reverberates in the strategic and operational planning of the armed forces and is also reflected in the highest-level security and defense documents of several countries.

The effects of climate change are already being felt. Extreme phenomena such as severe droughts, increasingly intense and frequent heat waves, desertification, or floods impact human groups with social, political, economic, and humanitarian consequences, putting pressure on and destabilizing governments, with evident consequences for the security and defense of states.

For Guimarães (2023), the effects of climate change concerning Brazil are related to the following factors: increased temperature, decreased rainfall, intensification of the dry season, sea level rise and coastal flooding, alteration of the rainfall regime, and intensification of extreme weather phenomena.

The first goal of this study was to examine how climate change will affect the military's missions. In other words, it was a matter of researching the effects of climate change and always taking care to analyze the phenomenon through the lens of fulfilling the missions of the armed forces. Once this objective was achieved, the next step was to investigate how such effects could influence the preparation and use of the Brazilian military instrument. The last step was to suggest options and paths for the implementation of policies in the Defense sector. To this end, a review of the existing literature was carried out in the search for consecrated approaches to address the issues raised.

2. Climate change and the mission of the Armed Forces

The mission of the Armed Forces is defined in Article 142 of the Constitution.

> The Armed Forces, constituted by the Navy, the Army and the Air Force, are permanent and regular national institutions, organized on the basis of hierarchy and discipline, under the supreme authority of the President of the Republic, and are intended for the defense of the Homeland, the guarantee of constitutional powers and, on the initiative of any of these, of law and order (Brasil, 1988, Art. 142).

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Complementary Law No. 97, of 1999, provided for the organization, preparation, and use of the Armed Forces. This law provides that the Armed Forces have subsidiary attributions, such as cooperation with national development, support for civil defense, and action to combat transboundary and environmental illicit acts in the border strip.

Climate change impacts the missions of armed forces around the world in a complex and diverse way, causing effects of multiple orders. According to Brzoska (2015, p. 172), the missions of the armed forces are affected by six different perspectives: (1) the debate around

the role of the forces as a relevant actor in the emission of greenhouse gases; (2) the budget dispute, since the public resources necessary for measures to mitigate the effects of climate change are large; (3) the direct effects of climate change on areas, facilities, and equipment of the armed forces; (4) the increased use of the armed forces in civil defense missions; (5) the possibility of engagement in humanitarian missions under the aegis of multilateral organizations in areas affected by natural disasters; and (6) the possibility of engagement in high-intensity conflicts due to geopolitical disputes against the background of environmental issues. Let's look at each of these dimensions below.

Figure 1. Perspectives on which Forces are impacted by climate change

Source: Prepared by the author based on Brzoska (2015, p. 172).

As it follows, I analyze each of these perspectives, bringing them to the Brazilian context, always intending to unveil the impacts of climate change on the Brazilian Armed Forces.

2.1. The armed forces and greenhouse gases

The international discussion on the production of greenhouse gases by the armed forces has been gaining prominence in specialized forums. Parkinson and Cottrell (2022) state that, together, the world's armed forces are responsible for 5.5% of total greenhouse gas emissions. This means that, if they were a country, the armed forces as a whole would have the fourth largest carbon footprint, behind only China, the United States of America (USA), and India.

The researchers' methodology aims to determine the carbon footprint (F) of the armed forces. For this, they developed a formula — F = ep(1+r)s — that takes into account the following factors: (1) the "per capita" emissions of the military (e); (2) total military personnel (p); (3) proportion between emissions generated by stationary activities and mobile activities, those that employ aircraft, spacecraft, ships, or land vehicles (1+r); and (4) a multiplier related to the carbon footprint of supply chain activities related to the military activities of each country (ies).

The study presented by the authors did not particularize Brazil, which, however, was cited as one of the ten countries in the world that contribute 60% of total carbon emissions, in addition to being one of the twenty largest in investments in the Defense sector (Parkison and Cotrel, 2022).

The concern of the aforementioned authors in seeking to measure the carbon footprint of the military segment of society highlights the importance of the topic, suggesting that it will gain increasing visibility and significance, which will lead to greater social pressure for all activities carried out by the armed forces to have a smaller carbon footprint.

Thus, it also seems clear that the trend will be greater social pressure for the acquisition and development of new Military Engagement Systems and Materials (SMEM, for its acronym in Portuguese) that use renewable energy sources, as well as for military installations of all types, which should seek new solutions and adapt to work with renewable energy sources or, at least, less polluting ones. It is clear that the equipment to be acquired by the armed forces must primarily meet the necessary requirements for their intended use in building the military capabilities needed to fulfill the mission. Once these conditions are met and the necessary operational levels are maintained, there is

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nothing to prevent the acquisition of SMEM with a lower carbon footprint, especially in the support activities of the armed forces.

2.2. Budget disputes

Measures for climate change mitigation and energy transition require substantial investments from national governments, which may impact the budget availability of the Defense sector.

Bachner, Bednar-Friedl, and Knittel (2019) found that adaptation to climate change affects government budgets directly, with regard to expenditure, but also indirectly, through changes in the tax base and consumption patterns of governments.

Another aspect to be considered is that the pressure to acquire SMEMs that use renewable energy sources, as seen in the previous section, and the adaptation of areas and facilities, as will be explored in the next section, will also impact the budget available to the Defense Sector.

Thus, the budget dispute tends to become more intense as the climate emergency presents itself more incisively, resulting in a possible decrease in the budget available to the armed forces.

2.3. Direct effects of climate change on areas, facilities, and equipment of the armed forces

The military itself can also suffer directly from the effects of climate change: seaside military installations, as well as ports and shipyards, for example, can be rendered unusable by rising sea levels. A report prepared by the US Department of Defense in 2018 concluded that about half of the approximately 3,500 US military installations reported adverse effects of climate change, such as floods, forest fires, droughts, or episodes of strong winds (EUA, 2018).

In the same vein, less navigable rivers can greatly affect the waterway logistics supply, which is especially important for the Brazilian Army in maintaining the logistics flow to the Force Units in the Brazilian Amazon. The literature review carried out for this study did not find scientific studies done specifically for the Brazilian Amazon; however, the extraordinary drought that occurred in that region in 2023 seems to be illustrative of the case. Concerning other regions, there are several studies relating climate change to the decrease in navigability in other important river basins. Guerrero *et al.* (2013) state that climate change can affect the navigability of waterways, both by changing the rainfall regime and by changes in the morphology of rivers, which can be affected by erosion and sedimentation.

2.4. Increasing the use of the armed forces in Civil Defense missions

The aforementioned Complementary Law No. 97 of 1999 provides in its article 16 that it is up to the Brazilian Armed Forces, as a general subsidiary attribution, to cooperate with the Civil Defense. An increase in the number, amplitude, and frequency of natural or anthropogenic disasters in Brazil will certainly lead to an even more frequent performance of its Armed Forces in this type of activity. This is due both to the capabilities of the Forces, which have the means, personnel, and material to be deployed in emergencies, and to the territorial distribution of the armed forces in the national territory, a characteristic that gives them a capillarity that allows prompt response in crises.

This is not an engagement peculiarity specific to Brazil. According to Boeno (2018), the US Department of Defense has concluded, in several studies and reports, that climate change will make natural disasters more frequent and intense, impairing the ability of the US and allied Armed Forces to provide humanitarian assistance and disaster relief.

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In the case of the Brazilian Army, the engineering system is what concentrates the capabilities that have historically been and are used in cases of support of Civil Defense. The use of these and other capacities must follow the provisions of the doctrine of the Force itself, contained in the Ministry's instructions contained in MD 33-I-01 — Use of the Armed Forces in Support of Civil Defense and the recently published campaign manual EB 70-MC-10.236 — Humanitarian Aid Operations.

> The occurrence, increasingly frequent, of the so-called extreme weather events, which affect areas with large concentrations of population, gives rise to the need to prepare the armed forces (AF) to be able to help civilian institutions preserve safety conditions and well-being for the inhabitants of the affected region (Brasil, 2023).

For Grenteski (2020), there is no doubt that, in the face of the climate change scenario, with increasingly frequent catastrophic events with unpredictable amplitude and results, there is an increasing need for the involvement of the Armed Forces, especially the Brazilian Army.

2.5. Engagement in humanitarian missions under the aegis of multilateral organizations in areas affected by natural disasters

Severe climatic phenomena, combined with political, economic, or demographic factors, may act as catalysts for internal conflicts in vulnerable countries. This could lead to the engagement of Brazilian forces in stabilization missions, typically occurring with Brazilian troops in a multinational effort under the aegis of multilateral organizations such as the United Nations (UN) and the Organization of American States (OAS).

Climate change will have a greater impact on the nations least prepared to address it. According to Mayer (2007), the negative consequences for human security in these areas will aggravate the already existing destabilizing trends. While climate change will undoubtedly have serious consequences for the richest and most developed nations, these countries are likely to be among the least affected by the direct impacts of the altered environment. Possessing substantial financial reserves in addition to efficient government structures, they will also be reasonably well equipped to deal with most negative effects. Unfortunately, this is not the case for poor and developing countries.

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An international response to the natural disaster caused by climate change that occurs in an already impoverished state in the presence of an armed conflict makes the humanitarian assistance operation much more complex, requiring the presence of military forces to stabilize the situation before or even during the provision of aid to the affected populations. The cases of Sudan, Somalia, and Mali are some examples of this reality (McGrady, Kingsley, and Stewart, 2010).

Thus, it is very likely to anticipate the use of the armed forces, under the aegis of the UN or even the OAS, in stabilization operations in the context of natural disasters aggravating pre-existing political and economic crises in vulnerable countries.

2.6. Engagement in high-intensity conflicts due to geopolitical disputes against the background of environmental issues

In the previous two sections, some possibilities for the use of the armed forces directly related to climate change were presented. But there is also the possibility of climate change being instrumentalized by states as a justification for military action that serves other interests.

Medeiros Filho (2023) already warns that the theme can gain an instrumental dimension as an element of competition between sovereign nations, with a tendency to increase conflict between countries, in an environment of international pressure and protection-

ist narratives. In this sense, the author warns that political rationality must be sought, avoiding the extremes of socio-environmental insensitivity — after all, the issue of climate change is real — or geopolitical naivety, which does not recognize the instrumentalization of the issue.

It is in this context that, in the Brazilian case, the defense of sovereignty over the Amazon is manifested, a biome whose preservation is considered fundamental for the achievement of the global goals of reducing the emission of greenhouse gases. These are undoubtedly legitimate and pertinent concerns of the international community. However, they can, to the detriment of Brazilian sovereignty, serve as a shelter for other interests. It is in this sense that the Brazilian Armed Forces should be prepared to act in defense of Brazilian sovereignty in dealing with issues that concern only Brazilians.

3. Influence of selected aspects on the preparation and use of the armed forces

Article 14 of Complementary Law No. 97 defines three basic parameters for the preparation of the Armed Forces: permanent operational efficiency, search for national autonomy, and correct use through the carefully planned mobilization of national potential (Brasil, 1999).

The operational efficiency of the Armed Forces may be affected in several ways related to the previously highlighted consequences of climate change. The pressures on the Forces to reduce their "carbon footprint" may imply the acquisition of new SMEMs, which of course should be done without prejudice to the troop's operability. However, these new SMEMs may give rise to new techniques, tactics, or procedures for their use, with a direct impact on the preparation and use of troops. Another aspect to be highlighted is energy availability. A possible restriction on energy consumption, related, for example, to the reduction of the supply of a certain source by replacing it with another that may be less efficient, may also have repercussions on the preparation and use of forces.

The budget dispute, especially in the context of a developing country and with so many aspects still requiring heavy investments from the federal government, may worsen due to climate change, resulting in restrictions that can severely affect the preparation and use of the Armed Forces.

The effects of climate change on areas, facilities, and equipment directly impact the preparation and use of the Armed Forces. For example, make it impossible to use fields of instruction, eventually affected by forest fires and fires; seaside facilities, like ports, naval bases, docks, and shipyards; and facilities of all kinds, subject to inclement weather of a varied and increasingly frequent nature, such as unroofing and flooding, with multiple damages.

The action of the Armed Forces in support of Civil Defense requires the military to apply specific competencies, which must be obtained in advance of the emergence of the crisis. In addition, in this type of operation, there is broad and deep inter-agency action. Operating in coordination with police, fire departments, civil defenses, environmental agencies, and health surveillance, in addition to a myriad of federal, state, and municipal agencies requires specific preparation from the military involved so that the action is efficient and effective.

If climate change creates or aggravates existing crises in fragile national states[2], resulting in the engagement of Brazilian troops under the aegis of a multilateral body, the need for specific preparation is quite clear, which will have to be adjusted to the specific case. However, there are commonalities in this type of engagement, which can be the object of the preparation of

2. For this work, fragile national states are those that cannot, due to their scarce means, deal on their own with the effects of climate disasters, imperatively needing international aid.

the Armed Forces staff, especially the troops already previously selected as being those available for prompt action in this type of operation.

Finally, operating in a high-intensity conflict is the raison d'être and the main mission of the Armed Forces. Therefore, even if it has as a background an issue related to climate change, it will require the same preparation already normally carried out by the Forces, requiring only that the highest-level planners be fully aware of the political, geopolitical, economic, scientific, and social issues surrounding the issue in order to build the most appropriate operational design for the solution of the imposed military problem.

Recommendations for the Defense Sector

Thus, as a conclusion of this work, some recommendations will be presented to better adapt the preparation and use of the Armed Forces in the context of climate change:

- Expand studies so that, ahead of time, operationally appropriate solutions can be put forward for the Forces to adopt. These could include the adoption of alternative forms of energy production and the adoption of solutions in Military Engagement Systems and Materials that contribute to the country's effort to achieve its goals of reducing greenhouse gas emissions;

- Prepare for a budget dispute increasingly impacted by government investments committed to mitigating the effects of climate change;

- Adopt measures that increase the resilience of areas and facilities under military administration, as well as Military Engagement Systems and Materials, in the face of extreme weather events;

- Maintain the preparation and readiness of troops to act in humanitarian aid operations in a joint and interagency environment, in the context of operations in support of Civil Defense, in national territory;

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- Maintain the preparation and readiness of troops to act in defense of the homeland, in high-intensity operations, and in the maintenance of sovereignty and national interests, within a framework of instrumentalization of the climate issue.

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