

Climate Change and Armed Forces: expanding capabilities and building resilience via interagency operations

Mudanças climáticas e Forças Armadas: ampliando capacidades e desenvolvendo resiliência por meio das operações interagências

Abstract: This article aimed to analyze the Brazilian military capabilities to deal with natural disasters and health emergencies, specifically those that are increasing in frequency and intensity, claiming the lives of thousands of people annually due to the effects of climate change. Episodes have also occurred in Brazil, and the extreme climate event in Rio Grande do Sul (2024) alone claimed the lives of 183 people. In general, countries do not have resilience capacity and are unprepared to respond. Thus, the Armed Forces have been called upon to support other agencies in managing environmental crises. International experiences indicate the importance of developing operational capabilities in response to specific situations. With an exploratory, descriptive, and applied qualitative approach, the work used bibliographic and documentary research techniques. The existing and possible threats and capabilities to Brazil were characterized. The study analyzed international experiences related to resilience in the environmental context. The results allow us to indicate actions to strengthen resilience by improving interagency relations, joint training, and doctrinal standardization.

Keywords: climate change; Armed Forces; capabilities; resilience; interagency operations.

Resumen: Este artículo tuvo como objetivo analizar las capacidades militares de Brasil para hacer frente a los desastres naturales y emergencias sanitarias, que han incrementado con frecuencia e intensidad en los últimos años y han afectado a muchas personas a cada año a causa de los efectos del cambio climático. Estos sucesos también se han producido en Brasil; por ejemplo, el evento climático extremo llevado a cabo en Rio Grande do Sul en el 2024 que ha victimado a 183 personas. En general, los países carecen de capacidad de resiliencia y no están preparados para dar una respuesta a estos eventos. Es en este contexto que las Fuerzas Armadas han sido convocadas a apoyar a otras agencias en la gestión de las crisis ambientales. Las experiencias internacionales demuestran la importancia de desarrollar capacidades de acción como respuesta al fenómeno. A partir de un estudio exploratorio, descriptivo y aplicado, de enfoque cualitativo, este trabajo utilizó técnicas de búsqueda bibliográfica y documental. Para ello, buscó caracterizar las amenazas y las capacidades existentes y necesarias para Brasil y se analizaron experiencias internacionales sobre la resiliencia en el contexto ambiental. Los resultados permiten indicar acciones para fortalecer la resiliencia con el fin de mejorar las relaciones interagencias, los entrenamientos conjuntos y una uniformidad en la doctrina.

Palabras clave: cambio climático; Fuerzas Armadas; capacidades; resiliencia; operaciones interagencias.

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1 INTRODUCTION

The images of the Salgado Filho Airport, in Porto Alegre, practically submerged, and of large animals stranded on the roofs of houses in Rio Grande do Sul during the floods resulting from an extreme weather event in 2024, materialized the words of the General-Secretary of the United Nations, who warned that “no one is safe from the destructive effects of climate change” (Guterres, 2021), which constitute one of the greatest challenges of the twenty-first century, as they put human survival on planet Earth at risk.

The acceleration in the rates of anthropogenic environmental change has given rise to new environmental threats to human safety. In recent decades, natural disasters, environmental degradation, decreased biodiversity, health emergencies, such as epidemics and pandemics, and extreme weather events have increased in severity and frequency¹ which, according to Nobre (2024, our translation), “will not stop happening.” Such phenomena have great economic and social impacts.

The forecast of the sixth assessment report of Working Group I of the Intergovernmental Panel on Climate Change (IPCC) indicated the Earth would probably reach or exceed 1.5 degrees centigrade of warming between 2030 and 2040, which would further aggravate this scenario (Allan, 2021). However, according to Nobre, in an interview with Bertoli (2024, n. p., our translation), several “scientists are very concerned because the predictions they [made] for the future are already occurring.”

According to concepts from the Centre of Research on the Epidemiology of Disasters (CRED), natural hazards are classified as geophysical (earthquakes, tsunamis, volcanic eruptions), meteorological (hazards from storms, extreme temperatures, and fog), climatic (droughts and natural fires), hydrological (floods, landslides, and wave actions), and biological (epidemics, insect infestations, and accidents with animals). Natural disasters resulting from these hazards will have a greater or lesser impact depending on the vulnerability in the affected locality and the preparation for crisis response and management (CRED, 2022), and the most affected by it are vulnerable communities, which have historically contributed less to current climate change (IPCC, 2023).

The COVID-19 pandemic, which originated from a virus harbored in bats, has also revealed the global impact of regional environmental imbalances. Several other epidemics have acquired the status of regional or international health emergencies, such as influenza, monkeypox, and Ebola, showing the need to develop response capability and reduce economic impact and mortality (Global Preparedness Monitoring Board, 2019).

These crisis situations have repeated every year in Brazil as well, and, as an example, only in the aforementioned flood that hit Rio Grande do Sul, in April and May 2024, 183 people died, another 27 remain missing (Sobe [...], 2024) and there were “losses of up to R\$ 58 billion in the state itself and R\$ 38.9 billion in other federation units, with an impact of about R\$ 97 billion on the Brazilian economy” (Brasil, 2024a, our translation).

¹ “The most commonly considered examples of extreme weather events include heat waves, cold snaps, heavy rainfall or snowfall, ice or hailstorms, droughts, extratropical or tropical cyclones, storm surges, and tornadoes” (Shepherd, 2023, n. p.).

That said, there is a growing acknowledgement in the national and international political context, in the scientific community, and in the private economic sector that climate change affects national and international security, as it acts as a multiplier of threats and vulnerabilities.

Climate change might accentuate social, political, and economic tensions that aggravate the countries' vulnerabilities to natural disasters, leading to wars, migrations, hunger, and terrorism (Huntjens; Nachbar, 2015). Additionally, countries often lack an adequate resilience capability, that is, they are not properly prepared to respond to these calamities and return to normality in a short period.

Thus, the Armed Forces have been urged to act in interagency operations² for the management of crises related to the effects of climate change (Moreira, 2018), which was once again materialized recently with the completion of Operation Taquiri II (Brasil, 2024b), in Rio Grande do Sul, which was the largest operation launched by the Brazilian State to face the consequences of an extreme weather event (Corrêa, 2024).

Recent international experiences also indicate the importance of developing new capabilities in the Armed Forces (Hidalgo Garcia, 2023), such as surveillance, response planning, and dealing with rainfall, hurricanes, forest fires, and heat waves.

In this regard, this study aims to analyze the Brazilian military capabilities in dealing with extreme weather events, natural disasters, and health emergencies, since it is expected that the Brazilian Armed Forces will also need to adapt to face the new scenarios resulting from the environmental impact. This was elaborated in an exploratory, descriptive, and applied manner, with a qualitative basis and bibliographic and documentary research techniques. This research will begin with considerations about the impacts of climate change worldwide and in Brazil.

2 CLIMATE CHANGE AND NATURAL DISASTERS

2.1 International impacts of climate change

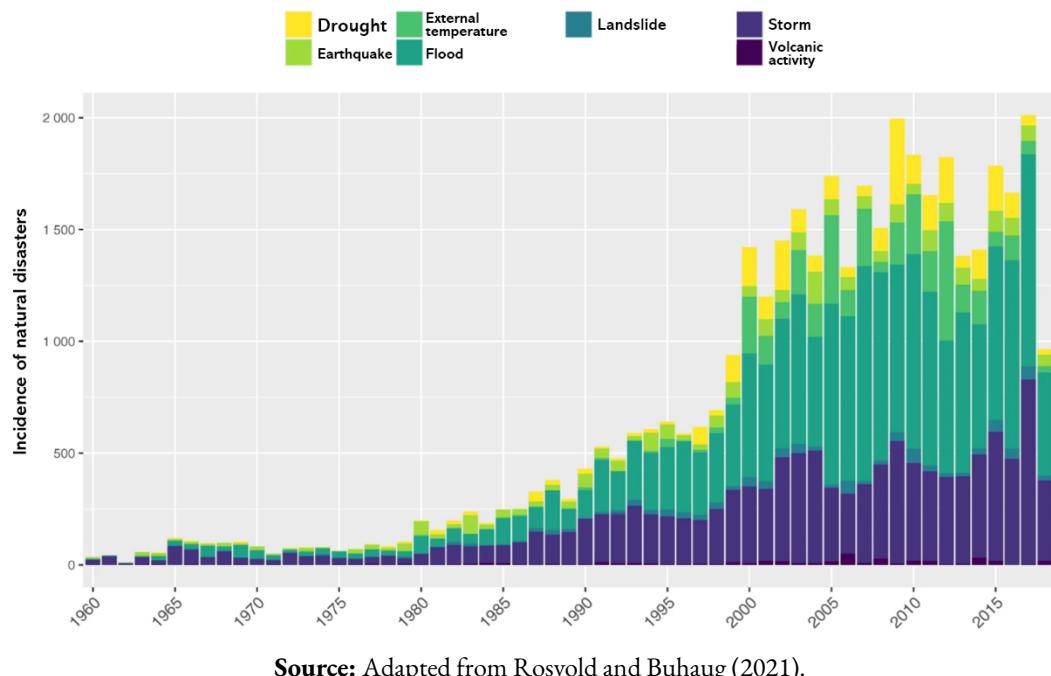
In the last six decades, natural disasters have grown in frequency and intensity, with a direct association with greenhouse gas (GHG) emissions and the rise in planetary temperature. Figure 1 illustrates this evolution regarding natural disasters, assembled by type, since 1960. The outstanding growth of floods, landslides, and droughts can be observed.

In 2021 alone, the Emergency Event Database (EM-DAT) recorded 432 disastrous events related to natural hazards worldwide. Overall, there were 10,492 deaths and 101.8 million people affected, with about US\$ 252.1 billion in economic losses. Asia was the most impacted continent, being hit by 40% of all natural disasters and accounting for 49% of total deaths and 66% of the total number of people affected. Floods accounted for 52% of all events in 2021 and had a 37% increase from the 2001-2020 average. Globally, compared

² "Interagency operations" is the joint work conducted during an operation, in which different agencies, organizations, or entities work together, coordinate efforts, and share information to achieve common goals (Lemos Júnior; Silva; Santos, 2023).

with the 20-year averages (347 events), 2021 was marked by a 24% increase in the number of disasters and major economic losses. Five of the 10 disasters that had the greatest economic impact in 2021 occurred in the United States of America and resulted in a total cost of \$112.5 billion. Hurricane Ida alone caused 96 deaths and the loss of US\$ 65 billion (CRED, 2022).

Figure 1 – Incidence of natural disasters by type, 1960-2018



Source: Adapted from Rosvold and Buhaug (2021).

The Latin American and Caribbean (LAC) region is the second most prone to natural disasters, in which 152 million people were affected by 1,205 disasters between 2000 and 2019. Floods are the most common disaster in the region. On 12 occasions since 2000, flooding in the region has caused more than \$1 billion in damage. Between 2000 and 2019, there was an average of 17 hurricanes per year and 23 category 5 hurricanes. In 2017, the hurricane season was the third-worst on record in terms of the number of disasters, countries affected, and the magnitude of damage. In 2019, Hurricane Dorian became the strongest ever recorded in the Atlantic to directly impact a territory. Drought affects the largest number of people in the region, causing crop yield reductions of 50% to 75% in regions such as central and eastern Guatemala, southern Honduras, eastern El Salvador, and parts of Nicaragua (OCHA, 2020).

Extreme weather events and changing weather patterns exacerbate food insecurity and limited access to clean water, cause air pollution, and raise transmission patterns of zoonotic and water-associated diseases. A broad and in-depth study on the impact of climate change on people's health revealed that 10 of the 15 indicators that measure health threats worsened from 1990 to 2023. In older adults over 65 years of age—deaths caused by excess heat increased by 167% (Blom *et al.*, 2024).

Health impacts are further exacerbated in areas where poverty, demographic pressures, and poor or inadequate public health infrastructure exist. The Pan American Health Organization (PAHO, 2017) estimates that more than one million premature deaths related to the impacts of climate change occur per year. From 2020 to 2023, the number of people who became ill in places affected by disasters in Brazil went from 54 thousand to 157 thousand (FIOCRUZ, 2024).

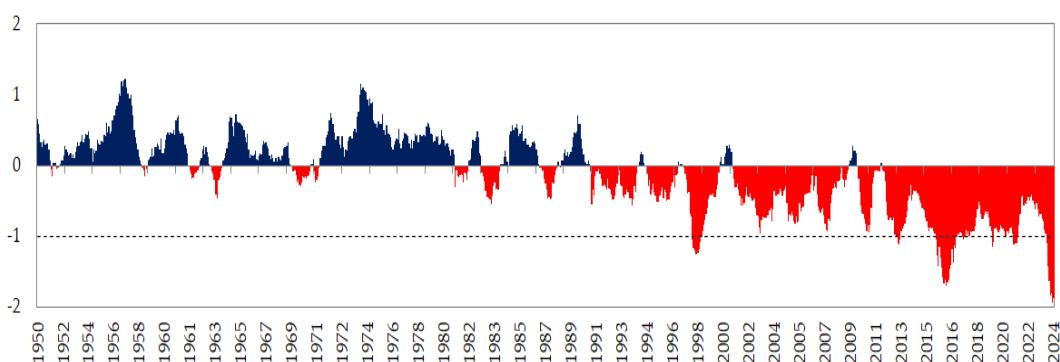
2.2 Impacts of climate change in Brazil

The Brazilian Atlas of Natural Disasters, which was prepared by the *Centro Universitário de Estudos e Pesquisas sobre Desastres* (CEPED – University Center for Disaster Study Research) shows that drought is the disaster that most affected the Brazilian population from 1991 to 2023, with more than 110 million victims. This is an old, recurring phenomenon responsible for 46% of the total records, followed by landslides, with 14.3%, and floods, with 9.2% (UFSC, 2024).

Droughts are historically recurrent in the semi-arid region of Brazil, characterized by reduced water availability and very limited storage of river capability, but the number of people affected by droughts increased significantly in 2014, including in other regions of the country, such as the South and Southeast (Brasil, 2014).

Figure 2 describes that, according to the National Center for Natural Disaster Monitoring (Cemaden), the drought in Brazil has been worsening since 1988, with the 2024 drought being the most severe since 1950 (beginning of the historic series), as shown by the Standardized Precipitation Index of Evapotranspiration (SPI) (Secas [...], 2024). According to the Brazilian Geological Service (SGB), there was also a significant increase in the occurrence of such a phenomenon in Brazil, with “406 records between 2014 and 2023, compared to only 92 in the previous ten years” (Fuhrmann, 2024, n.p., our translation).

Figure 2 – PPE indicator, 1950-2024



Source: Cemaden (Secas [...], 2024, n.p.).

CEPED found that floods affected 1,543 municipalities (27.7% of Brazilian municipalities), leaving 1.4 million homeless or displaced, from 1991 to 2012. The region that recorded the highest proportions of floods per municipality was the North, which comprises the Amazon

biome and the largest number of rivers in Brazil. The Southeast and South regions, which are the most densely populated, were also greatly impacted by floods during the same period (UFSC, 2013).

The most updated data from the SGB, from 2014 to 2023, indicate that 314 flood records were recorded, compared to 182 in the previous decade, and that 6 of the 10 largest floods in the Amazon River occurred in the last 10 years (Fuhrmann, 2024).

The South region has also suffered, especially Rio Grande do Sul, where the Taquari and Caí Rivers have reached their three highest flood records in recent years. In Uruguaiana, the Uruguay River recorded one of its largest floods in 2024, with similar events in previous years (2017 and 2022) (Fuhrmann, 2024).

The extreme weather event that occurred in 2024 and inflicted damage to 90% of the state of Rio Grande do Sul (Salóes, 2024) was not an isolated phenomenon, and “the floods in Porto Alegre, due to the overflow of the Guaíba River, are only one part of a larger problem” (Fuhrmann, 2024, n.p., our translation) related to climate change, which has also caused great losses to the Brazilian economy.

According to the estimate of the World Bank, the economic impact of disasters, from 2008 to 2012, was more than US\$ 15 billion for the public and private sectors considering only the four major phenomena recorded during this period: a) Santa Catarina, 2008: floods killed 110 people and caused damage to the Brazil-Bolivia gas pipeline; b) Alagoas and Pernambuco, 2010: the worst rainy season in 20 years affected about 1 million people in two of the poorest states in Brazil; and c) Rio de Janeiro, 2011: approximately 1,000 people died due to floods and landslides in seven cities in mountainous region (WORLD BANK, 2012).

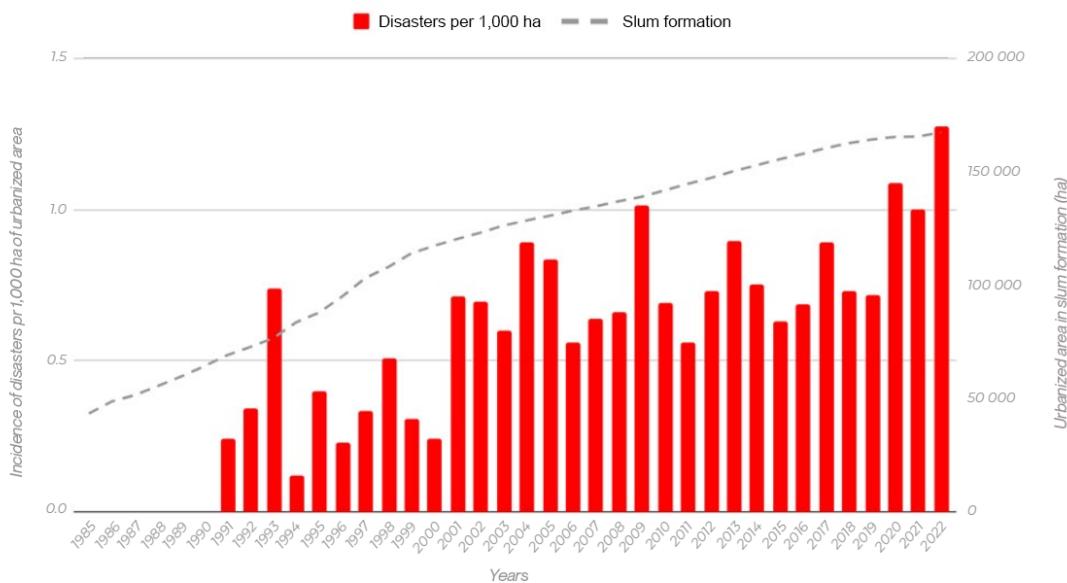
The 2024 Rio Grande do Sul floods is estimated to cost R\$ 97 billion to the Brazilian economy, according to a survey by the National Confederation of Trade in Goods, Services and Tourism (CNC) (Nakamura, 2024).

One of the important phenomena associated with the extent and impact of natural disasters in the country is urbanization: without proper planning, cities grow in areas at risk. Brazil has 123 thousand hectares of urban areas in regions known to be susceptible to floods, landslides, droughts, and other climatic disasters; in addition, for every 100 hectares of favelas that grew in the country from 1985 to 2022, 16.5 were in areas at risk (MAPBIOMAS BRASIL, 2024).

Figure 3 illustrates the evolution of natural disasters in Brazil, in parallel with the phenomenon of urbanization of areas at risk.

The data are corroborated by the study conducted by the *Secretaria Especial de articulação e Monitoramento* (Special Secretariat for Articulation and Monitoring), subordinated to the Civil House of the Presidency of the Republic, which mapped 1,942 municipalities susceptible to disasters associated with landslides, waterlogging, downpour, and floods—almost 35% of the total of Brazilian municipalities, which concentrate more than 8.9 million people, that is, 6% of the national population (Figure 4). Previous data indicated, in 2012, 821 municipalities susceptible to disasters (Brasil, 2023).

Figure 3 – Natural disasters in Brazil and urbanized areas in favelas, 1985-2022



Source: MAPBIOMAS BRASIL (2024).

Figure 4 – Location of the 1,492 Brazilian municipalities most susceptible to natural disasters in 2022



Source: Secretaria Especial de Articulação e Monitoramento.

3 ARMED FORCES AND THE RESPONSE TO THE CONSEQUENCES OF CLIMATE CHANGE

The World Economic Forum's 2022 global risk landscape survey, conducted with governments, companies, and social actors, shows that, in the perception of respondents, environmental risks are among the most worrying regarding economic impact and probability of occurrence (WEF, 2022).

This scenario of the last decades has included a new task in the missions of the Armed Forces of developed countries. In addition to defending national sovereignty, peacekeeping operations abroad, supporting public security, protecting critical infrastructure, border control, and supporting national development, service members must be ready to respond to natural disasters and provide humanitarian assistance (Godnick, 2018), developing appropriate capabilities for such tasks.

Boeno, Boeno and Marques (2015) point out that climate change will require military operations to support Civil Defense, making it necessary to expand the capability to operate in restricted and delimited environments (land, sea, and air) and to deal with the fragility of some countries.

The authors point out that climate change will reduce maneuvers and training, which are essential for training and readiness, and will require the Armed Forces to act in situations of floods and other catastrophes, in the context of an outbreak of vector-borne diseases and increased complexity to deal with disease outbreaks and pandemics, changing the operational environment for the troops.

Pérez (2017) also highlights the need for international cooperation and information sharing among the Forces and the growing tendency for populations to consider the Armed Forces as guarantors of an immediate response to natural disasters.

Concepts such as collaboration, cooperation, and interagency coordination with the participation of military and civilians have never sounded more current than in the third decade of the 21st century (Figueiredo; Moreira, 2022). The case of Operation Taquari II is paradigmatic in this sense; over 80 public and private agencies participated (Corrêa, 2024), requiring the use of more than 34,000 military, police, and public agents, requiring more than 3,300 flight hours in the rescue effort, transport of donations, and aeromedical evacuations, in addition to the use of more than 5,600 engineering vehicles, which built 13 bridges for the crossing in various locations in the state, thus constituting the largest interagency humanitarian effort in the history of Brazil (Salões, 2024).

3.1 Some International Experiences

Since the beginning of the 21st century, some Armed Forces in Europe and North America have begun to treat climate change as a matter of threat to national security, reformulating or expanding their military capabilities. The cases of Spain, in 2005, and Portugal, in 2014, are noteworthy, as they created specific military units with the capability to act in disasters (Boeno; Boeno; Marques, 2015).

In June 2019, the Security Board of the European Union (EU) recognized for the first time the relevance of environmental issues and climate change for security and defense, in the context of the EU Global Strategy. The impacts on the planning and development of military capabilities were highlighted, aiming at the achievement of the missions and operations of the Common Security and Defense Policy (CSDP) (Rodrigues, 2021).

The United Kingdom has been developing a doctrine relevant to the interagency action of its Armed Forces in disaster response operations. Joint Doctrine Publication (JDP) 3-52, "Foreign Disaster Relief Operations: The Military Contribution," serves to guide the planning and conduct of military support abroad. The document guides the preparation of troops to act in humanitarian aid efforts in countries with less capability to withstand the effects of natural disasters, or that are more susceptible to political instability, civil disorder, and unrest (United Kingdom, 2016).

The Center for Climate and Security, based in Washington, DC, in the United States, highlights that one of the most urgent threats to national and global safety in the 21st century is climate change. They state that the impacts of these threats might destabilize the lives of human beings at all levels, and that each region of the world will face severe risks to national and global security over the next three decades (NSMIP, 2020).

In the same way, the North Atlantic Treaty Organization (NATO), via the Climate Change and Security Center of Excellence, based in Montreal, Canada, indicates that the growing effects of a changing climate pose direct and indirect threats to human and national security around the world (CCASCOE, 2024).

Climate change also brings new challenges for the military in Latin America, of which the Armed Forces would be the only government agencies able to respond to major catastrophes, and these institutions must begin to prepare for these responsibilities as soon as possible to minimize the economic impact on their future budgets, according to Paterson (2017), which shows a list of capabilities that must be developed in the short term for this new profile of tasks.

The U.S. Department of Defense defines capability as the ability to complete a task or perform a sequence of actions under certain conditions and specified performance level (United States, 2021). In Humanitarian Assistance and Disaster Relief (HADR) missions, critical capabilities to be performed on the ground are considered: a) situational awareness; b) meeting the basic needs of those affected; c) communications; d) search and rescue; e) medical assistance and funeral services; f) shelters and evacuation of survivors; g) security; h) arrival of humanitarian assistance; i) removal of debris; and j) restoration of services/utilities (Paterson, 2017). These international experiences can inspire the Brazilian Armed Forces, which is already deeply engaged in interagency operations associated with environmental issues.

3.2 The Brazilian reality regarding interagency action, normative documentation, and capability to support Civil Defense

The topic of climate change and the growth in the frequency and severity of natural disasters was addressed in the *Cenário de Defesa* 2020-2039 (2020-2039 Defense Scenario), of the

Ministry of Defense's strategic planning (Brasil, 2017b). The document shows that environmental disasters, such as those resulting from droughts, floods, and windstorms, could cause political and social instability, due to hunger, human displacement, and the disruption of economic activities.

In the same way, the 2020 *Política Nacional de Defesa* (PND – National Defense Policy), when describing “The National Environment,” indicates the possibility of using the Armed Forces by noting that “impacts caused by climate change or pandemics may lead to serious environmental, social, economic, and political consequences, requiring a prompt response from the State” (Brasil, 2020, our translation).

Note that, despite the possibility of action raised in the PND (Brasil, 2020), the approach to the relationship between climate change and the use of the Armed Forces is still punctual in the basic documents of the Brazilian Defense. Even the so-called *Livro verde da defesa*, published in 2017, which highlighted the actions taken by the Armed Forces to prevent climate change, had no impact on the 2020 revision of the PND and the *Estratégia Nacional de Defesa* (END – National Defense Strategy) (Duarte, 2023).

The reality is that the use of the Armed Forces in Civil Defense activities must occur in cooperation with the *Sistema Nacional de Proteção e Defesa Civil* (SINPDEC – National System of Civil Protection and Defense), consisting of bodies and entities of the federal public administration, the States, the Federal District and the Municipalities, and public and private entities with significant performance in the area of Civil Protection and Defense, under the central coordination of the National Secretariat for Civil Protection and Defense, an agency of the Ministry of National Integration.

The Armed Forces will not assume operational control of the *Órgãos de Defesa Civil e de Segurança Pública* (OSP – Civil Defense and Public Security Agencies) but will act along with them. In situations of assistance in natural disasters, the coordination of actions will be the responsibility of the *Centro Nacional de Gerenciamento de Riscos e Desastres* (CENAD – National Centre for Risk and Disaster Management). The Armed Forces, via their military organizations located in risk areas, must be aware of the local contingency plan for civil protection and defense and participate, as far as they are responsible, in simulation exercises conducted by the Secretariat of Civil Protection and Defense and/or by the Joint Operations Chief, when planned (Brasil, 2016).

The Brazilian Armed Forces have been acting in response to disasters since at least the 1960s, when they participated in the rescue operation for the victims of the “Caraguatatuba Hecatomb”³ episode, in 1967, “one of the earliest precursor events of interagency operations in Brazil” (Figueiredo; Moreira; Caminha, 2023, p. 5, our translation).

Such type of action in support of Civil Defense continued to take place, periodically, in the following years and with increasing frequency. Just to quote, we can remember two remarkable episodes of military action: the radiological accident in Goiânia, in 1987, and the Serrana operation, in 2011, in Rio de Janeiro, in response to heavy rains in the cities of the region, episodes that took place before the publication of the manual *Operações Interagências* (Brasil, 2012b).

Analyzing only the participation of the Brazilian Army and its capabilities in support of Civil Defense in responding to natural disasters, Silva *et al.* (2018) emphasize the relevance of its operational capabilities in disaster response exercises in a scenario of action that is becoming frequent.

³ As the natural disaster caused by heavy rains in Caraguatatuba, on the coast of the state of São Paulo, was called then (Corrás, 2018).

Few institutions might deploy security support, transportation, construction and repair, command and control, medical care, distribution of donations, evacuation of the wounded, treatment and distribution of water, clearance of roads, and fuel supply.

Looking at human security in an extended way and the defense sector's engagement with climate change, Távora, França and Andrade Lima (2022) draw attention to the urgency of beginning the process of adapting the Brazilian Armed Forces to deal with the challenges that are already posed and that will certainly arrive more intensely, such as missions to support Civil Defense, organizational transformations and adaptations, coping with situations of floods, catastrophes, proliferation of vectors, disease outbreaks, and new pandemics. The authors state that the simple identification of risks, which were pointed out in the 2020-2039 defense scenario and the 2020 PND (Brasil, 2020), are not enough.

It is urgent to expand the scope of these documents to promote tactical actions and create mechanisms, units, and services within the Forces to mitigate the associated risks, in addition to developing military capabilities to conduct Civil Defense support activities involving logistics, engineering, transportation, health, humanitarian services, and command and control. Thus, it is necessary that the structuring documents of the National Defense, that is, PND and END (Brasil, 2020), clearly incorporate guidelines for such adaptation (Duarte, 2023). The preparation time seems to have run out, as indicated by the COVID-19 pandemic and the Taquari II operation.

4 BUILDING RESILIENCE VIA INTERAGENCY OPERATIONS

The 2030 Agenda for Sustainable Development and the Sendai Framework for Disaster Risk Reduction 2015-2030 provide guidance for countries to find ways to reduce their exposure and vulnerability to disasters. The achievement of the Sustainable Development Goals (SDGs) depends to a large extent on progress in the implementation of strategies to reduce disaster risk and improve response capability. Hence the need to strengthen political commitments, promote investment in risk reduction, and incorporate disaster resilience into sustainable development planning processes (Bello; Bustamante; Pizarro, 2021). Resilience is the ability of a system, community, or society, exposed to a threat, event, or disturbance, to resist, absorb, adapt, and recover from its effects in a timely and effective manner, including the preservation and restoration of its basic structures and functions, its identity, and at the same time preserve the capability for adaptation, learning, and transformation (Allan, 2021).

The Sendai Framework for Action was defined at the Assembly of the United Nations (UN) Office for Disaster Risk Reduction 2015-2030, which was held in the city of Sendai, Japan, in 2015, and has the following priorities (UNDRR, 2019):

1. Substantially reduce global mortality from disasters by 2030, aiming to decrease the average per 100,000 global mortality rates in the 2020-2030 decade compared to 2005-2015.

2. Substantially reduce the number of people affected globally by 2030, aiming to decrease the global average per 100,000 in the 2020-2030 decade compared to 2005-2015.
3. Reduce direct economic loss from disasters related to global gross domestic product (GDP) by 2030.
4. Substantially reduce disaster damage to critical infrastructure and disruption of basic services, including health and education facilities, also by building their resilience, by 2030.
5. Substantially increase the number of countries with national and local disaster risk reduction (DRR) strategies by 2020.
6. Substantially increase international cooperation with developing countries via support to complement their national actions for the implementation of this framework by 2030.
7. Substantially increase the availability of and access to multi-hazard and disaster risk early warning systems, information, and assessments to people by 2030.

Due to the magnitude and complexity of response of a natural disaster, it can hardly be faced by a single agent or State alone (Garcia, 2014). Efficient coordination is needed in a wide variety of areas, ranging from the exchange of scientific knowledge and information to the use of coordinated containment, logistical, technical, and financial measures and the introduction of joint health, social, and economic regimes. In many cases, global action is required to overcome a disaster, in a framework of international cooperation and solidarity. This type of coordination will necessarily involve international organizations, developed countries, and countries in the region.

At the national level, interagency coordination can be a key factor in a country's vulnerability mitigation and coping capability. Both the scope of the COVID-19 crisis, with its multidimensionality of effects, and the Taquari II operation, due to its magnitude, made it clear that this type of event cannot be addressed by a single sector (for example, the health sector and Civil Defense). The response must be integrated and coordinated by authorities responsible for the economy (financial aid and recovery measures), social institutions (education, social safety nets), and agencies responsible for public safety. A nation's development-planning institutions can play an important role as a link between the various bodies that make up their institutional structure.

The coordination of national policies must consider the action of local government and its associated vulnerabilities, deficiencies in technical or economic capability to provide the necessary services. If there is no coordination, local authorities and federal authorities may implement conflicting emergency measures, as observed in the Brazilian response to the pandemic (Bello; Bustamante; Pizarro, 2021; Rodrigues; Carpes; Raffagnato, 2020).

Coordination with other actors is as important as coordination within government spheres. When a disaster outstrips the government's capability, public sector action must be coordinated

with the efforts of the private sector and civil society. In these cases, it is important to orient action to all agents (e.g., safety protocols) and to each sector in particular (for the private sector, logistics, especially for the supply of goods and services; for academia, scientific research; and for civil society, compliance with emergency measures, humanitarian action, and voluntary efforts).

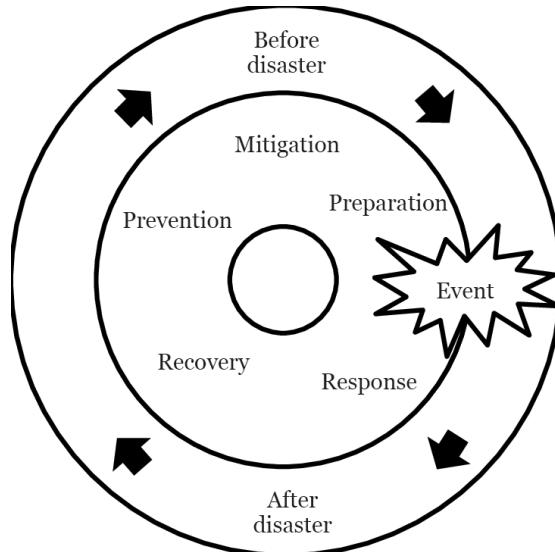
The National Secretariat of Public Security (SENASP), of the Ministry of Justice and Public Security, produced, and has been consolidating, the *Doutrina Nacional de Atuação Integrada de Segurança Pública* (DNAISP – National Doctrine of Integrated Public Security Action), which is in its second edition (Integrantes [...], 2020). Reinforcing this initiative, the *Escola Superior de Defesa* (ESD – Brazilian Defense College), at the request of the Institutional Security Office of the Presidency of the Republic, created the Interagency Coordination and Planning Course (CCOPI), aiming to integrate and train actors from various agencies that work in the Integrated Border Protection Program (PPIF) (Brasil, 2021).

In the same vein, the Ministry of Defense published its most recent version of the *Manual de Operações Interagências* (Interagency Operations Manual) in 2017 (Brasil, 2017a). Despite some criticism regarding its suitability for use by the civil bodies of the Brazilian State (Figueiredo *et al.*, 2023), the document demonstrates the Defense's concern with the issue and is used by other non-military institutions, such as the MS Fire Department (Figueiredo *et al.*, 2023).

4.1 A Doctrine for Interagency Operations in the Response to Natural Disasters and Health Emergencies

The central organization of the National System of Civil Protection and Defense is the National Secretariat of Civil Protection and Defense (SEDEC), which is linked to the Ministry of National Integration. SEDEC is responsible for taking actions to prevent, mitigate, prepare, respond, and recover damage caused by disasters, which are provided in the National Policy for Civil Protection and Defense. It also seeks to integrate disaster risk reduction measures into planning, urban development, health, environment, climate, water management, geology, infrastructure, education, science and technology, and other sectoral policies to promote sustainable development (Brasil, 2012a). Figure 5 illustrates that this policy seeks to cover all phases of disaster management.

Analyzing recent actions to reduce disaster risk in Brazil, Ribeiro (2017) states that the Civil Protection and Defense System is still dominated by the paradigm of structural functionalism, in which disasters are understood as an unforeseen, unpredictable, and natural phenomenon that randomly disturbs social life. The system treats the cause of a disaster as an exogenous factor (drought, landslide, flood, etc.) that suddenly disrupts the normal functioning of a community. This perspective is related to the “preparation and response” paradigm, which reactively manages disasters and emergencies as they occur. Although the law clearly says that risk management should be a priority, the whole system is reactive, not proactive.

Figure 5 – The Disaster Management Cycle

Source: Rodrigues, Carpes and Raffagnato (2020).

Responding to natural disasters is a complex and urgent action that involves several state and non-state actors. In this interagency context, two elements are key to the management of crises, such as those resulting from natural disasters: coordination and planning (Figueiredo; Moreira, 2022). Negligence in the prevention and mitigation phases creates difficulties in the execution of the preparation and response to the event, compromising the entire disaster management cycle.

Brazil has yet to adopt the guidelines of the Sendai Framework for Disaster Risk Reduction 2015-2030, which hinders a strategic perspective in the face of new environmental challenges, hindering the efficiency of the preparation and response phases for natural disasters and health emergencies (Rodrigues; Carpes; Raffagnato, 2020).

Analyzing interagency coordination and planning in the management of crises caused by natural disasters in Brazil and Australia, Figueiredo and Moreira (2022) highlight the absence of joint planning, without the effective participation of agencies in decision-making during the preparation of plans, and a very fragile coordination, dominated by informal arrangements and relationships, with little trust and information sharing. This scenario occurs in the civil-military relations of interagency operations and limits the success and speed of actions, weakening the capability for resilience.

The UN has acquired great expertise in humanitarian crisis management and disaster response. In such cases, military forces engaged in humanitarian tasks are subject to the guidelines on the use of foreign military and civil defense assets in disaster relief operations, also known as the Oslo Guidelines (OCHA, 2007). This document guides the coordination and planning of response actions, involving both civilian and military components, and highlights the fundamental importance of civilian leadership in interagency operations of this nature.

CENAD and the Ministry of Defense, as the main actors in this field and the natural leaders in crisis management, should seek doctrinal approaches, producing joint planning, discussing prevention, mitigation, preparation, response, and recovery measures together.

Along the lines of CCOPI (Brasil, 2021), ESD, in Brasília, can be the catalyst for this approach, promoting courses, seminars, publications, and simulations aimed at crisis management, especially those related to natural disasters and health emergencies. Notably, health emergencies of interest in Brazil are not restricted to epidemics and pandemics with an impact on human health, which necessarily need to involve the Ministry of Health in crisis management. Given the strategic relevance of agribusiness for Brazil, possible outbreaks of animal diseases that may affect national herds and cause serious economic and social impact are also very important. In the latter case, interagency crisis response and management operations must rely on the expertise of the Ministry of Agriculture, Livestock, and Supply.

5 FINAL CONSIDERATIONS

Considering the emerging phenomenon of natural disasters and epidemics of infectious diseases associated with climate change, this study investigated aspects related to the management of these crises via interagency operations with the participation of the Armed Forces. The international doctrinal evolution of this field in the Security and Defense Sector was characterized. Brazilian responses to natural disasters and epidemics have been reactive, denoting few effective planning and coordination actions in the prevention and mitigation phases.

The Armed Forces and the Ministry of Defense are already confronting this type of crisis, in support of the Civil Defense agencies, but they are bound by the doctrinal limitations and the precarious coordination in this state sector.

The results indicate that some strategic actions can contribute to strengthening the Brazilian resilience capability in terms of environmental security. The doctrinal integration of key actors in crisis management, such as CENAD and the Ministry of Defense, can contribute decisively to the effectiveness of prevention, mitigation, preparedness, response, and recovery measures. The development of courses, seminars, publications, and simulations focused on crisis management related to natural disasters and health emergencies can consolidate this integration and facilitate interagency coordination and planning.

Note that the routine use of the Armed Forces in interagency operations in support of Civil Defense has already developed the necessary capabilities for its performance, even though the structuring documents of the Defense timidly address the issue. In this sense, the list of capabilities prepared by Paterson (2017) is a good parameter to be adapted to the Brazilian reality.

We suggest for further studies to follow up on the constructs discussed here, such as the detailed analysis of interagency operations that have occurred in the last ten years, identifying good practices and opportunities for improvement in the coordination, planning, and conduct of the management of natural disasters and health emergencies.

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