

## CRITICAL ANALYSIS OF THE BRAZILIAN ENVIRONMENTAL SAFETY SYSTEM

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**ABSTRACT:** Conflicts stemming from the dispute over natural resources have become increasingly more frequent. Extreme weather events have intensified and have equally become more frequent owing to global warming. Although the consequences of such phenomena have repercussions on public safety, the processes of analysis incorporating the environmental dimension in this context have not been fully understood. This paper assessed how systems of environmental protection interconnect with those of crime prevention, forming the environmental safety system. It is an exploratory-descriptive research carried out through questionnaires evaluated by State environmental control agencies, exploring eight major domains: their origins; their staff, distribution and organization; logistics and operational structures; the use of geotechnologies; integration; operational results; regional analysis; and the general analysis of military environmental police. The last section, in conclusion, reviews the main lessons learned and proposes future lines of research that can be developed based on this topic. It highlights that the military environmental police should be the most significant agent of nature protection in the country. It reveals the existence of weaknesses and opportunities for improvement to be implemented.

**Keywords:** Environmental oversight. Environmental protection. Environmental monitoring. Military police. Command and control

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## 1. INTRODUÇÃO

The demand for natural resources has become higher due to the growth of the world population. The consumption of such resources has led them to get scarcer and scarcer. Recent studies indicate that eighteen violent conflicts have been fueled by the exploitation of natural resources since 1990 (UNITED NATIONS ENVIRONMENT PROGRAMME, 2009). However, researchers suggest that short-term climate variations alone are not enough to trigger conflicts, yet societies, less resilient to such changes may face an asymmetric increase in demand and supply of subsistence resources and services (BUHAUG, 2010).

In Brazil, internal tensions have intensified due to the dispute over the use, consumption and/or insufficiency of natural resources, thus, promoting crimes and generating social crises with direct repercussions on public order (FOLLY, 2018). The Pastoral Land Commission (CPT for its acronym in Portuguese) has identified that in 2016, the most significant number of conflicts in the field has been recorded since 2008, equivalent to 4.2 occurrences per day (CANUTO; LUZ; ANDRADE, 2016).

State governments created conservation units (UC for its acronym in Portuguese) to preserve areas of significant ecological, landscape and natural resources, as well as have established special rules for their exploration and management. On the other hand, the strategy of setting up conservation units alone has not been sufficient to avoid the incidence of environmental crimes such as deforestation, which increased by approximately 480% from 2002 to 2011 (Matricardi, Pedlowski, & Jorge, 2014 and Pfaff, Robalino, Sandoval, & Herrera, 2015).

The expansion of the agricultural frontier around conservation units is yet another threat. Cultures advance over buffer zones, reducing connectivity corridors with other PAs or forest fragments, threatening

biodiversity conservation through loss of genetic variability and demographic and/or environmental fluctuations (PRIMACK; RODRIGUES, 2001). In the State of São Paulo, for instance, the area of sugarcane cultivation alone increased by 39% around those protected areas between 1971 and 2008 (MORAES; MELLO; TOPPA, 2017). For this reason, special forces were created for their protection. In Brazil, one of these environmental protection forces is the environmental military police (PMAm for its acronym in Portuguese).

The National Environmental System (SISNAMA for its acronym in Portuguese) (Brazil, 1981) establishes a structure with a series of entities responsible for the protection of nature. Although PMAs are not explicitly cited as part of that system, they are among the most significant national environmental protection forces. They are part of the state military police which is part of the public security system and is responsible for conducting a specialized type of policing which is the environmental policing.

This study aimed to demonstrate the interconnection between SISNAMA and other social systems and, to contextualize the current moment of the environmental safety system and its consequences in the public order. It is focused to evaluate the attributions and the role of the Brazilian PMAs in the environmental safety system and in the other systems responsible for protecting citizens and the environment in Brazil. It also aims to diagnose the state in which they are found using a survey carried out by semi-structured questionnaires, to identify the strengths and weaknesses, as well as the opportunities and the threats to which they are subject.

## 2. REVIEW OF THE LITERATURE

### 2.1 ENVIRONMENTAL PROTECTION SYSTEMS

### 2.1.1. Criminal Justice System

The Brazilian criminal justice system (SJC for its acronym in Portuguese) comprises the justice systems (SJ for its acronym in Portuguese), the penitentiary (SP for its acronym in Portuguese) and the public security system (SSP for its acronym in Portuguese)<sup>1</sup>. The SJC is under the Executive and Judiciary powers and is structured in such a way that the public power acts from the prevention of criminal infractions, through investigations of crimes, trial, conviction or acquittal, and culminating in the incarceration of the offender when appropriate.

The SJ is described in Chapter III, Title IV of the Federal Constitution (Brazil, 2016a), which establishes the competencies of each body that integrates it. The competencies are organized at the federal and State levels through the courts and judges and the bodies that perform the functions essential to the functioning of Justice; the Public Prosecutor's Office (MP for its acronym in Portuguese), the Federal Attorney General's Office (AGU for its acronym in Portuguese) and state and Federal District, the Public Defender's Office and the lawyers.

The SP is composed of State entities which are responsible for enforcing the custodial or restrictive sentences of freedom imposed by the courts and judges to the offenders. Article 5 of the Constitution (Brazil, 2016a) establishes the following types of punishment: deprivation or restriction of liberty; loss of property; traffic ticket; alternative social provision; and suspension or prohibition of rights. Private or restricted prison sentences are served in federal or state penitentiaries or prisons, which are administered mostly by prison secretariats or departments, and are carried out in closed, semi-open, or open regimes (Brazil, 1984).

The SSP is established in Article 144 of the Constitution (Brazil, 2016a), and aims

to "preserve public order and the safety of people and property." (LAZZARINI et al., 1987) summarize public order as the absence of any act of violence against people, property or the state itself. Actually, since the public order is the absence of disorder, it is incorporating the concept of public security that is the law enforcement State provided by laws, codes and other legal provisions.

The SSP includes the following bodies: federal police (PF for its acronym in Portuguese); federal highway police (PRF for its acronym in Portuguese); Federal Railway Police (PFF for its acronym in Portuguese); state civil police (PC); state military police (PM); state military fire brigades (CBM for its acronym in Portuguese); and the municipal guards (GM for its acronym in Portuguese). In addition to these entities, the public security system has other subsystems that are an integral part of it, such as the intelligence system (FERRAZ, 2016).

The Magna Carta establishes that the environment is a commonwealth of the people and essential to the healthy quality of life (Brazil, 2016a). Thus the concept of the public order needs to be redefined, since the environment is also commonweal, and is closely related to the fundamental human rights. Therefore, any change to it means a disorder, breaking public order, which may or may not achieve public safety. As an example, a forest fire caused by natural causes is harmful to public order; however, if it results from an anthropic action, it will be criminal, hurting public safety.

Redefining the concept of public order comprises extending its scope to the environment, due to the numerous services promoted by it essential to human survival and healthy life style (COSTANZA et al., 1997). In this respect, the constitutional mission of the PM is of the essence, since it is the mission of open police patrolling and

<sup>1</sup> With the establishment of the Unified Public Security System (SUSP for its acronym in Portuguese) in June 2018 (Brazil, 2018b), the Federal Government established as the central body of this system the Extraordinary Ministry of Public Security and became

integrated by the entities of the SSP, SP and by the other strategic and operational members. However, for didactic purposes and for a better understanding, the systems will be described separately to better demonstrate their systemic relationships.

the preservation of public order (Brazil, 2016a).

### 2.1.2. Crime Prevention System

Cerqueira (1985) proposed that responsibility of crime prevention and violence, which belongs to public security, should be shared with actions promoted by social actors other than those that make up the criminal justice system. The crime prevention system (SPC for its acronym in Portuguese) comprised the actions of open police patrolling (under PM, PRF and PFF responsibilities); the actions of the investigative police and the judicial police (competences of the FP and PC); the actions of the MP; criminal justice actions; the actions of lawyers; the actions of SP; the actions of the media; actions of government; and the actions of the population, for example, in the denunciation of criminal actions, and those promoted by the third sector. On the other hand, the environment has its own system, which will be dealt with in the next section.

### 2.1.3. National Environmental System

Law 6.938/1981 (Brazil, 1981) established the National Environmental Policy (PNMA for its acronym in Portuguese) with its principles, concepts, objectives and instruments. Also, it created the National Environmental System (SISNAMA for its acronym in Portuguese) and outlined its structure.

SISNAMA is comprised by a higher entity, the Governing Council; by an advisory and deliberative body, the National Environment Council (CONAMA for its acronym in Portuguese); by a central body, the Secretariat of the Environment of the Presidency of the Republic; by the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA for its acronym

in Portuguese) and, the Chico Mendes Institute for Biodiversity Conservation (ICMBio for its acronym in Portuguese). The regional entities, are the state ones and are responsible for the management of conservation units, execution of programs and projects, and for the control and inspection of activities capable of causing environmental degradation. The local bodies are the municipal areas responsible for the management of conservation units, and for controlling and supervising these activities, in their respective jurisdictions.

SISNAMA, although apparently disconnected from criminal justice systems and the crime prevention, has an intercessor: the environmental military police (PMAm). Although they are part of the state military police and are not explicitly discriminated against in the structure of SISNAMA, the PMAs consider themselves members of this group, due to their role in a specific type of policing focused on environmental inspection activities<sup>2</sup>.

The PM (Military Police), in general, is only observed for their original role in public safety. The role played in protecting and defending the environment is sometimes unknown to society. Environmental patrolling is the most preventive type of ostensive policing carried out by the PMs (Regional Military Police Corporations) since it transcends the generations and not only aims at safeguarding the environment at present, but above all, for the future. Therefore, they actually integrate SISNAMA. The Federal District government, for example, has already recognized its PMAm as a sectional body of SISNAMA by decree (DISTRITO FEDERAL, 2016).

### 2.1.4. Environmental Safety System

The environmental safety system (SSA for its acronym in Portuguese) is a proposition of the authors. The SSA would

<sup>2</sup> The same would apply to environmental bureau, specialized environmental agencies of the Federal and State MPs, forest clusters of the CBMs and GMs, and

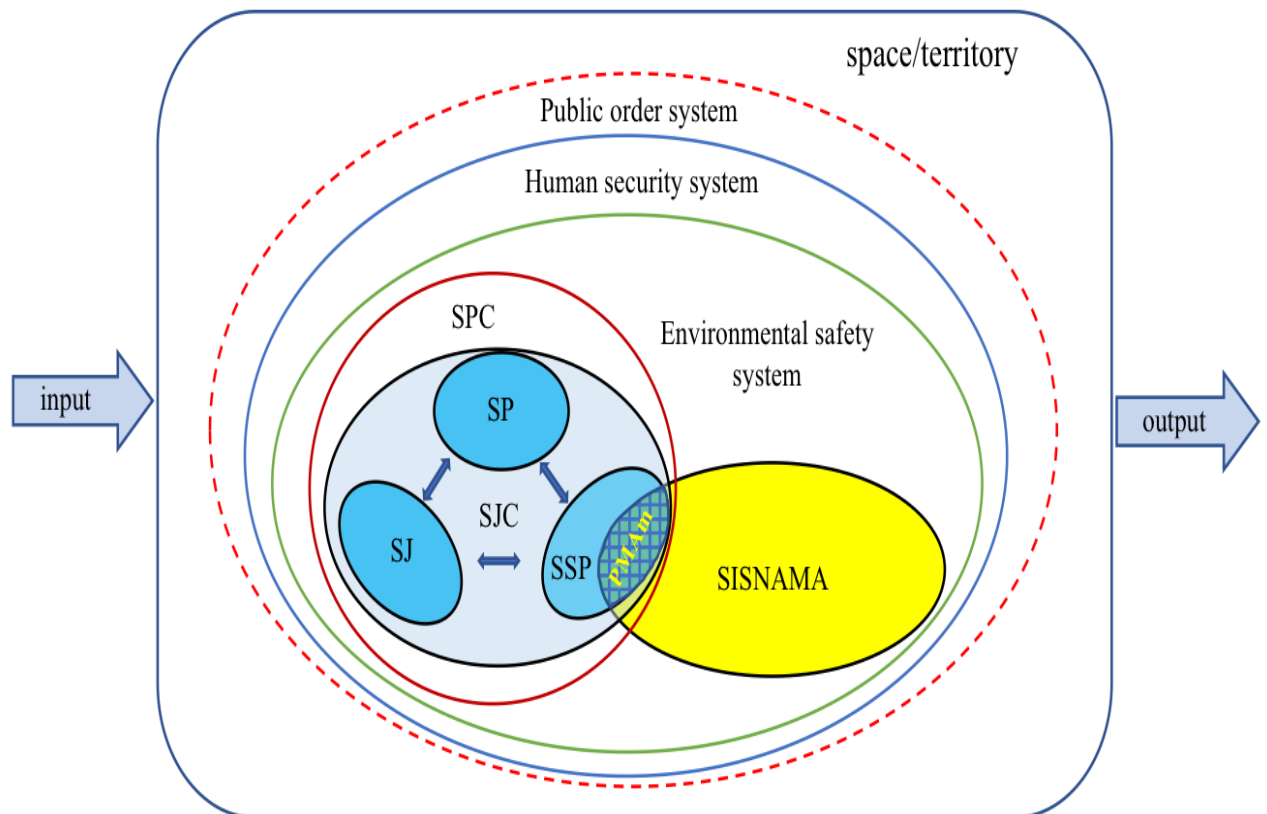
the PCs' specialized environmental stations, as part of the SJC could also integrate SISNAMA, although it cannot be said that they feel like members of it like the PMAs.

be responsible for the preservation of the environment as a whole, including SJC, SPC and SISNAMA, and their respective bodies, the intersection of which would be the PMAm. In turn, the SSA would be fully inserted in a broader context, which is the human security. The concept of human security was instituted by the United Nations (UN) (ORGANIZAÇÃO DAS NAÇÕES UNIDAS, 2010), extrapolated from the traditional security dimensions established by the States. It brings to the center of the issue the individual himself, with his need for employment, income, decent housing, health, a healthy environment, and their safety in the face of crime. This, in turn, is contained in the

broader concept of public order, previously regarded as the absence of a disorder in society. The spaces/territories are precisely where all the social relations occur, that are also influenced by the inputs and outputs of the energy flows that happen in them (Odum, Barrett & Shimizu, 2007 and Aquino & Assis, 2005).

Figure 1 shows the structure of systemic interrelationship between the systems mentioned to give a concept proposed.

**Figure 1** – Structure of systemic interrelationship



**Legend:** Criminal justice system (SJC) with its systems of justice (SJ), penitentiary (SP) and public security (SSP); environmental military police (PMAm); crime prevention system (SPC).

**Source:** Authors, 2018.

The intersection of SISNAMA with the SPC occurs mainly with the PMAs. Because they belong to both systems, they have a dual function: public safety and environmental safety. The daily routine of these specialized agencies includes preventive actions, carried out through regular patrols (in urban, rural and forest or natural environments) and environmental education activities; while repressive actions take place when they flagrantly and/or administratively fine environmental offenders. There are other SSP bodies that, by analogy, could integrate that intersection, such as GM and CBM with their respective environmental groups.

The Brazilian Institute of Geography and Statistics (IBGE for its acronym in Portuguese) found that the Brazilian military police had a total of 425,248 members in 2014, while GM was constituted in 1,081 (19.4%) of the 5,570 Brazilian municipalities (IBGE, 2015). Although it cannot be said that all of these GMs had environmental clusters, this topic deserves to be the object of future research, since, in this article, it will be only the PMAs.

## 2.2 THE ENVIRONMENTAL MILITARY POLICE

### 2.2.1. From Open Patrol Policing to Environmental Policing

The history of the PM began in May 1809, when Prince Regent D. João created the Military Division of the Royal Guard of Police, in Rio de Janeiro (Neves, 1994 and Holloway, 1997). In 1831, this police force was extinguished because of a revolt, and in its place was created the Corps of Municipal Guards Volunteers in the City of Rio de Janeiro, by Act that authorized them also to create them in the provinces for the promotion of public safety. The provinces, later, in the Republic, would become states, ratifying the regional character of the PMs

<sup>3</sup> Collective of gendarme: military belonging to a special type of corporation, which is responsible for

(Chaves, Pinto, & Madureira, 1992 and Muniz, 2001).

Since then, military police forces have been used as gendarmeries<sup>3</sup> and have been activated only in cases of emergency or in the case of external wars, such as the Paraguayan War (1864-1870) or regional revolts, such as revolutions Praieira (1831-1832) and Liberal (1842) (Gomes, 2010, 2013). The PMs were increasingly distanced from the attribution of promoting public safety on the streets and were being quartered waiting for special state defence missions (MUNIZ, 2001).

The PM mission during the Republican period did not differ much from those assigned to it in the Empire. The innovation was the idea emerged in 1908 that considered the state military forces "auxiliary" of the Army (CHAVES; PINTO; MADUREIRA, 1992). Until 1964, the military police forces' dual mission persisted, those inherent in the actions of "Police" and "Military Forces" (MUNIZ, 2001). The exceptions were the police of the states of São Paulo, Paraná and Santa Catarina, which created their environmental units in 1949, 1957 and 1962, respectively.

The PMs, because of their centennial connection with the Army, was also influenced by the National Security Doctrine that had been maturing in Brazil since 1950. The creation of the National Information Service (SNI) helped to integrate more the Armed Forces with the PF and the PM (ARQUIDIOCESE DE SÃO PAULO, 1985). In July 1969, PMs were reorganized to adapt to the new internal security guidelines established by that doctrine, which created laws and rules on all types of activities in national life (Brazil, 1969).

The 1969 decree brought about three critical changes in the role played by the PM, which was primarily focused on the safeguarding of sensitive points and actions to control civil unrest. The first, and most important, was the fact that they were given the monopoly of dress-uniformed open

ensuring order and public safety in France and some other countries (HOUAISS, 2007).

patrol police, dismantling them and returning them to patrolling the streets. Second, it linked them to the public safety agencies for public order maintenance. Third, it assigned them competence to act in the cases of internal defence or territorial defence (Brazil, 1969).

In the following year, the Government regulated this decree-law, establishing the principles and norms for its application, with MPs responsible for the various types of urban policing, as well as for forest, water, river and lake policing. This decree was amended in 1983 (Brazil, 1983). Although there was a climate of social tension because of the process of political openness, the decade of 1980 was the period when environmental awareness grew most in Brazil (SVIRSKY; CAPOBIANCO, 1997). According to Dean (2007), at that time the environment was already pointed out as the second biggest concern among young people in big cities.

The criticisms of the model of economic development adopted up until then were accentuated. The concept of sustainable development presented by the World Commission on the Environment (COMISSÃO MUNDIAL SOBRE MEIO AMBIENTE E DESENVOLVIMENTO, 1991) at the Stockholm conference in 1972 had already become global. In Brazil, the effects of industrialization began to take shape: river pollution, acid rain caused by the emission of polluting gases, depletion of the ozone layer, and the greenhouse effect, among others. Cubatão would become an icon of this development model.

In the 1990s, this awareness was further increased among Brazilians by the United Nations Conference on Environment and Development (Organização das Nações Unidas, 1992 and Dean, 2007). International non-governmental environmental organizations (NGOs) in the 1990s already had tens of millions of members and had multiplied more than twelve times in Latin America (LEIS, 1999).

It was in the geopolitical context of the 1980s and 1990s that most Brazilian

military environmental police units emerged. The dual role played by the PMAMs imposed on them two roles: the public safety police and the environmental safety police.

### 2.2.2. The Public Security Police and The Environmental Security Police

The hybrid public safety police function and the environmental safety function is one of the main characteristics of the PMAM. They carry out their *in-situ* and *ex-situ* environmental policing activities. Its members can act in the typical police functions within the PA and in its buffer zone, including private natural heritage reserves (RPPN for its acronym in Portuguese) as well as outside those (MOREIRA et al., 2015).

In 2013 in the State of Rio de Janeiro, for example, ten percent of the occurrences occurred within the state protected areas; 49% in their buffer zones and 41% outside them. According to the Environmental Police Command (CPAM for its acronym in Portuguese) of the Military Police of the State of Rio de Janeiro (PMERJ for its acronym in Portuguese), this phenomenon occurred due to the presence of environmental police officers and park guards of the State Environmental Institute (INEA for its acronym in Portuguese) (RIO DE JANEIRO, 2013).

The hybrid characteristic of Brazilian PMAMs is not common in countries with a tradition in the management of protected areas. Authors on field technical visits to the agencies responsible for protected area services in the United States (National Park Service and US Forest Service), Canada (Canada Parks), Argentina (National Parks Administration), Chile (National Forestry Corporation), South Africa National Parks (SANParks), Zimbabwe National Parks and Wildlife Management Authority (ZNPWMA) and Kenya (Kenya Wildlife Service (KWS), found a different reality.

First and foremost fundamental difference: they all exercise their police power

exclusively on the spot. All crimes occurring outside protected areas under their responsibilities, including environmental ones, fall within the competence of other law enforcement agencies or regulatory agencies. Secondly, they are true paramilitary forces, trained in military academies, such as Canada, or in their own militarized academies. The KWS, for example, has about 3,800 members and ZNPWMA has fifteen times more park guards per protected hectare than its Brazilian counterpart, the ICMBio. Thirdly, mainly the African countries, they manage administrative and financial, the management of fauna and flora, the fight against forest fires, the investigation of crimes against visitors and environmental crimes, operations against hunters. Such assignments allow them to promote international cooperation arrangements for the management of transboundary parks, such as Limpopo and Victoria Falls. Finally, they have their own intelligence sector that articulates with other national and international organisms aiming at the exchange of information and solutions to the problems, which rarely occurs in Brazil.

This item presented the role that the PMAs play in public safety and environmental security. On the other hand, natural phenomena, disputes over the use and/or consumption of natural resources or due to their scarcity promote reflection on public safety through the interaction between different entities of environmental safety systems.

### **2.2.3. The Internalization of Environmental Costs in Public Security**

The neoclassical economic theory did not internalize the environmental costs in its productive processes since they had no economic value. As environmental awareness grew, as well as criticisms of the model of development adopted by global society, it was observed that the use of natural resources promoted cost and generated externalities

that were not incorporated into the productive process (SEROA DA MOTTA, 2006).

Gradually, economic and accounting<sup>4</sup> instruments were created to internalize the externalities of production processes and the use and/or consumption of natural resources through their pricing, to be compensated in the market via a price system (MALHEIROS, 2002). Costanza et al. (1997), for example, estimated that ecosystems promote the equivalent of \$ 33 trillion (US dollars) in environmental services annually. Thus the regulations that set emission standards and established sanctions for noncompliance emerged; the establishment of fees, taxes and charges for the use or degradation of a natural resource, such as oil royalties; and legislation on accountability, of which the law on environmental crimes is an example, among others (SEROA DA MOTTA, 2006).

Public security costs, or lack thereof, are constantly priced by the market. The Inter-American Development Bank has published a report estimating the costs of crime and violence in 17 countries in Latin America and the Caribbean between 2010 and 2014. In these countries, crime costs averaged between 2.41% and 3.55% of the region's gross domestic product (GPD - PIB for its acronym in Portuguese) or between US\$ 115.3 billion and US\$ 171.8 billion, considering the exchange rates of 2014 (JAITMAN et al., 2017). In Brazil, the Federal Government estimated that the economic costs of crime in 2015 were R\$ 285 billion, or 4.38% of GDP (Brazil, 2018a).

The internalization of environmental costs in the productive chain, use and consumption of natural resources is consolidated methodologically and within the Brazilian legal framework, and the assessment of the costs of crime and violence are routinely calculated. On the other hand, the values of the environmental damage generated by the conflicts arising from the

<sup>4</sup> Technical Pronouncement CPC 29, dated August 7, 2009, aims to establish the accounting treatment, and

related disclosures, related to biological assets and agricultural products (COMITÉ DE PRONUNCIAMENTOS CONTÁBEIS, 2009).



disputes over the use of those resources, and/or still, due to their scarcity, nor the damages caused by the intensification of extreme natural events and their impacts and consequences on public safety, have not yet been incorporated into their costs. As (LEIS, 1999) says, "ecological problems are transnational and produce unexpected natural effects."

Halvard Buhaug & Urdal (2013) point to the problem of the urbanization bomb, which is explained by three phenomena: natural growth, rural-urban migration and rural reclassification in urban areas. Other environmental issues associated with desertification, prolonged droughts, and salinization of soil can deteriorate agricultural production by pushing people further into cities, with the possibility of being accentuated by climate change (WARNER et al., 2010). Rapid and high population growth in cities, particularly in peripheral and less resilient countries, causes serious environmental problems such as water scarcity and contamination, homelessness and reduced sanitary conditions, leading to deterioration of already precarious public services (BUHAUG, 2010).

The rains of 2008 in the State of Santa Catarina and those of 2013 in the Serrana region of Rio de Janeiro caused floods and landslides, leaving hundreds of homeless and dozens of dead. One less familiar face of these tragedies was the fact that police forces had to reinforce patrolling due to the looting of supermarkets and homes abandoned or banned because of the rains ("Santa Catarina tem 12 cidades em calamidade pública; chuvas contabilizam 99 mortes," 2008 and "Em Petrópolis (RJ), moradores denunciam saques em casas interditadas," 2013).

During the water crisis of 2014 in the State of São Paulo, water supply cars had to be escorted by police vehicles so as not to be stolen or abducted (OLIVEIRA, 2015). In 2017, the Federal District experienced similar problems of water shortage, forcing its PMAm to search for clandestine or irregular electricity and water hookups (Rodrigues,

2017 and Nascimento, 2017). In the city of Rio de Janeiro employees of the electricity distribution company were hijacked to re-energize the power after the heavy rains of February 2018 (PAMPLONA, 2018).

The World Bank estimates that approximately three percent of households in sub-Saharan Africa, South Asia and Latin America can migrate within their own countries by 2050 to avoid the effects caused by climate changes that provoke an intensification of events, such as the examples cited previously (RIGAUD et al., 2018). Folly (2018) warns that, between the years 2000 and 2017, 8.8 million people have been forcibly displaced in Brazil. Among the reasons for these migrations are armed conflicts, natural disasters or anthropogenic interventions, various degradations, and disputes over the use or possession of natural resources. In 2016 there were 1,536 conflicts in the field involving land, water and labour, a record since 2008. They have advanced more in the Amazon and in the Cerrado, the new frontiers of capital expansion (CANUTO; LUZ; ANDRADE, 2016).

The reverse is also true: public safety problems impact on environmental security. It is not uncommon for criminal groups to avail themselves of the illicit exploitation of natural resources to earn income, which is re-employed in the financing of their illegal actions. In the Ivory Coast the illegal trade diamonds, cocoa and cotton contributed to the founding of armed groups. The mineral resources of The Democratic Republic of the Congo, such as copper, gold and diamonds, played an essential role in financing rebel groups and perpetuating the conflicts that they experienced at the end of the 20th century (UNITED NATIONS ENVIRONMENT PROGRAMME, 2009). The major problems related to natural resources in Colombia were land grabbing by armed groups that promoted deforestation for the cultivation of illicit narcotics and from the commerce of those raising funds (UNITED NATIONS et al., 2013).

Criminal groups that dominate the territory in some of the most deprived areas

of the State of Rio de Janeiro, where they already economically exploit the distribution of cooking gas, illegal cable TV signal and transportation services have awakened to the exploitation of natural resources. The gangs started to use illicit sand and gravel extraction in the municipality of Seropédica, a necessary substance for all civil construction works, as well as to promote illegal deforestation, mainly in the West Zone of the capital, for real estate exploitation in the area (Coelho, 2018, "Polícia desarticula quadrilha de crimes ambientais que atuava na Zona Oeste," 2018 and Otávio, Araújo, & Altino, 2018).

Brazil and its public security forces are not prepared to face these new scenarios. They must strategically plan to address the consequences that come and will come from conflicts over natural resources and climate change. There is a need to incorporate new methodological mechanisms to internalize the environmental costs resulting from natural events and/or conflicts related to natural resources as well as public security costs and, also to value the environmental services provided by the PMAs. In this context, their role is much more important and relevant because of its hybrid characteristics.

### 3. MATERIALS AND METHOD

The methodological aspects of this research can be classified as inductive, as to the logical argument, which is the most common method in empirical science; applied in its nature by using existing knowledge to an actual situation; quantitative approach to the problem, since some phenomena are interpreted and not calculated. It also uses statistical methods to express their results such as the exploratory-descriptive study on specific objectives by addressing little explored subjects that fill a gap in scientific and systematized knowledge

about the problem, as well as details the characteristics of a specific group obtaining this information through the application of questionnaires with open, closed and dependent questions to the PMAs of all 26 Brazilian states<sup>5</sup> and the Federal District (DF), ICMBio and IBAMA, covering their origins, their staff and their distribution in the Brazilian territory, their logistics-operational structures, their operational results and their integration with other organs. From the point of view of its design, or technical procedures, it is considered bibliographical because it has used scientific books and articles, it is still documentary by the use of second-hand documents, such as statistical reports and tables, and is a survey of according to the census carried out in those organs (Silva & Menezes, 2005, Volpato, 2007, Gil, 2016 and R. A. dos Santos, Paulista, & Hora, 2017).

The data were tabulated and grouped according to the Brazilian regional political-administrative division. IBAMA did not return the completed questionnaire until the conclusion of this article.

The *Sturges* technique was used for the exploratory analysis of socio-geographic data about logistic-operational data (FERREIRA, 2014). From the perspective of the bibliographical research, it was sought to identify state of the art on the researched topic. For this purpose, the bibliometric method was used, with the data mining technique in the Scopus database, which is the most extensive database of abstracts and citations of peer-reviewed literature. It comprises approximately 22,000 titles from more than 5,000 editors, of which 21,500 are peer-reviewed journals in scientific, technical, medical and social sciences, including humanities (REDONDO et al., 2017).

Database searches were done using the core words of the title of the article "environmental safety system," "environmental police" and "Brazilian State"

<sup>5</sup> Brazilian States and abbreviations : Acre – AC, Alagoas – AL, Amazonas – AM, Amapá – AP, Bahia – BA, Ceará – CE, Espírito Santo – ES, Goiás – GO, Maranhão – MA, Minas Gerais – MG, Mato Grosso do Sul – MS, Mato Grosso – MT, Pará – PA, Paraíba

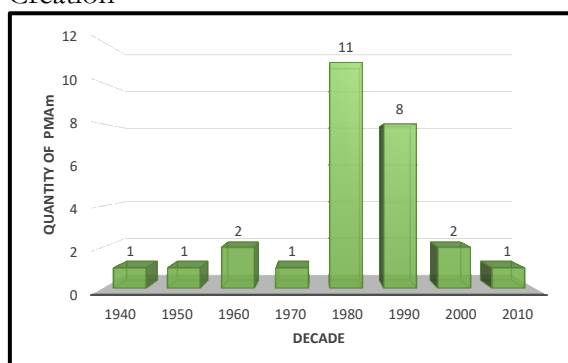
– PB, Pernambuco – PE, Piauí – PI, Paraná – PR, Rio de Janeiro – RJ, Rio Grande do Norte – RN, Rio Grande do Sul – RS, Rondônia – RO, Roraima – RR, Santa Catarina – SC, Sergipe – SE, São Paulo – SP e Tocantins – TO

singly, arranged two by two, and finally, the three together. Subsequently the keywords "environmental monitoring," "environmental protection," "environmental monitoring" and the respective thesaurus and terms that represent them in English literature, using the same combinatorial method. The searches were limited to articles published in journals and conferences in the last ten years (2009 to 2018). In the end, after reading their abstracts, 15 empirical articles with some adherence to the theme of this research were selected. It should be noted that when all the terms were searched together, the search resulted in five articles, but without any adherence to the theme researched in this study.

## 4. RESULTS AND DISCUSSION

### 4.1 THE BIRTH OF ENVIRONMENTAL MILITARY POLICE

**Graph 1** – Environment Military Police Creation



**Source:** Authors, 2018.

This was a period of increased environmental awareness and criticism of the model of economic development at the global level.

### 4.2 HUMAN RESOURCE, REGIONAL DISTRIBUTION AND ORGANIZATION

The PMAm are present in all federative units (UF) of Brazil (26 states and

the Federal District). The reduction suffered from 2014 to 2018 was approximately 25%, reminding that these data were obtained from the research of Moreira et al. (2015), which gathered data from 23 UF (85%). This survey obtained information from 100% of them, which indicates that this loss may have been higher than that found in Table 1. The Southeast regions and the Midwest lost almost half of their workforce over the time period. On the other hand, the Northeast and North regions managed to increase the number of military environmental police officers by 43% and 16%, respectively. Another relevant fact raised in the survey was the fact that the effective number of PMAm is currently almost eight times higher than that of ICMBio.

**Table 1** – Human Resources PMAm (2014 and 2018) and ICMBio (2018)

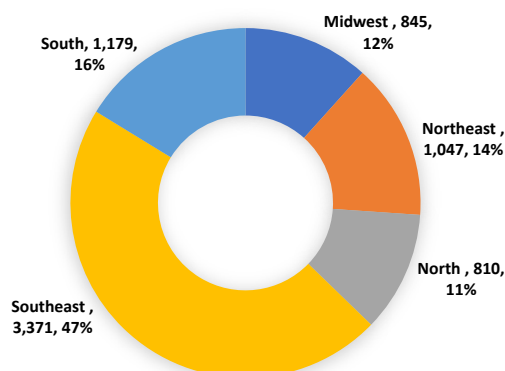
REGION	HUMAN RESOURCES PMAm (2014)	HUMAN RESOURCES PMAm (2018)	HUMAN RESOURCES ICMBio (2018)	DIFFERENCE BETWEEN HUMAN RESOURCES PMAm 2014-2018 (%)
Midwest	1,255	845	150	-48
Northeast	710	1,047	193	43
North	696	810	247	16
Southeast	5,046	3,371	220	-49
South	1,359	1,179	111	-15
Brazil	9,066	7,252	921	-25

**Source:** IHP, 2014; PMAm, 2018; ICMBio, 2018

The Southeast region, on the other hand, is the region that has kept the largest number of PMAm from 2014 to 2018. In that last year, the relative frequency was 47%. The disproportion between the staff of the PMAm and of the public prosecutors of the ICMBio (those with competence to impose fines) is flagrant in all regions.

The other regions did not present significant differences among the existing populations of the PMAm in the year 2018 (Graph 2).

**Graph 2 – PMAm's Human Resource Distribution by Region (2018)**



Source: PMAm, 2018.

The PMAm's are organized on the first administrative level in nine large commandos, thirteen battalions, six independent companies and a platoon, and from each one, they are unfolding in the likeness of the national military force, the Brazilian Army (EB). In this way, each administrative level receives the attribution of policing part of the territory, so that in every area of the state and the country there is an environmental military police unit responsible for its environmental safety.

Having observed the regional distribution of personnel and their territorial organization, the analysis of the logistic-operational structures available for carrying out the environmental inspection in the national territory is followed.

#### 4.3. LOGISTICS-OPERATIONAL STRUCTURE

Regarding the logistic structure of transport, it was observed that around 80% of all vehicles and vessels are in the Southeast (55.4% and 57.2%) and South (23.0% and 21.0%) regions. The most deprived area of vehicles and vessels was the Northeast (5.3% and 4.4%) (Table 2)

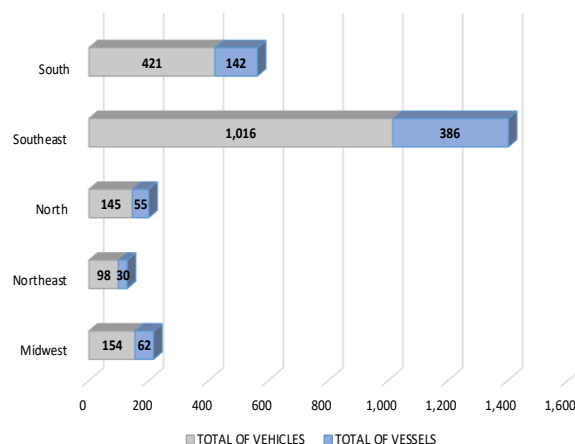
**Table 2 – Vehicles and Vessels Distribution by Region (2018)**

REGION	TOTAL OF VEHICLES		TOTAL OF VESSELS	
Midwest	154	8.4%	62	9.2%
Northeast	98	5.3%	30	4.4%
North	145	7.9%	55	8.1%
Southeast	1,016	55.4%	386	57.2%
South	421	23.0%	142	21.0%
<b>Brazil</b>	<b>1,834</b>	<b>100.0%</b>	<b>675</b>	<b>100.0%</b>

Source: PMAm, 2018.

In Graph 3 it is possible to visualize the regional disproportion as to the transport logistics of the PMAm's among the Brazilian regions. The ICMBio did not have this type of information in the General Coordination of Protection.

**Graph 3 – Vehicles and Vessels by Region (2018)**



Source: PMAm, 2018.

Vehicles and vessels are the primary means of transport for PMAm's. It is through them that the police conduct their inspections and operations. In the Northern region, the vessels are especially prominent, since the rivers are the main routes of land displacement. The Northeast has the second largest extension of the country's road network (26.5%). These two regions are the most deprived of terrestrial transport infrastructure (CNT: SEST: SENAT, 2017) (Table 3).

**Table 3** – National Road Network by Region (Km)

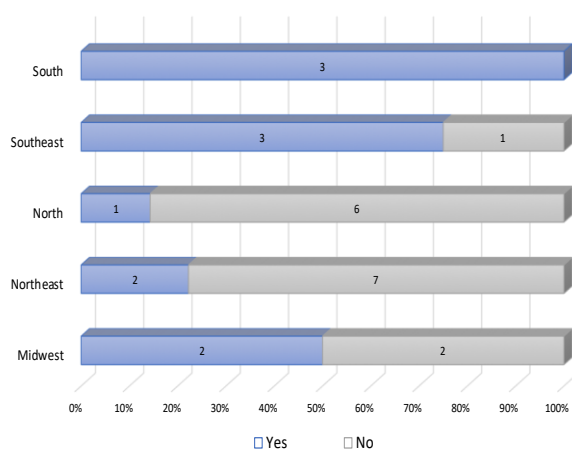
REGION	TOTAL EXTENSION		PAVED EXTENSION	
Midwest	205,560	11.8%	30,222	14.2%
Northeast	460,116	26.5%	59,835	28.1%
North	147,889	8.5%	21,970	10.3%
Southeast	533,781	30.8%	62,417	29.3%
South	388,275	22.4%	38,442	18.1%
<b>Brazil</b>	<b>1,735,621</b>	<b>100.0%</b>	<b>212,886</b>	<b>100.0%</b>

Note: Sum of federal, state transitory, state, municipal paved and planned highways.

**Source:** Pesquisa CNT rodovias, 2017.

Another type of policing that uses much more expensive technological resources was also researched: air policing. This type of policing requires the use of aircraft of high acquisition and operational costs, as well as the employment of highly specialized professionals for its operation. Only eleven of the PMAs perform this type of policing (Graph 4).

**Graph 4** – PMAs Air Policing by Region (2018)



**Source:** PMAm, 2018

In the North, the most devoid of highways and of greater territorial extension, only the State of Rondônia conducts aerial patrolling. The units that carry out this policing are mostly used by aircraft of the air groups of their respective corporations, or aircraft leased or assigned by other institutions.

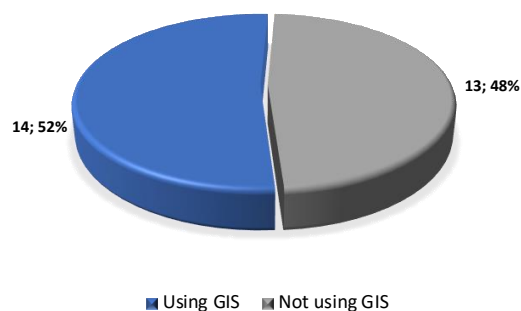
Transportation logistics is of particular importance for state command and control actions, as agents responsible for inspections must travel by land, air or water

environments for their supervision and/or operations. Thus, it can be affirmed that the Midwest, Northeast and North regions are the most lacking in logistic transportation resources.

#### 4.4. THE USE OF GEOTECHNOLOGIES IN OPERATIONAL PLANNING

Geotechnologies are increasingly accessible due to the easiness and intuitiveness of their application and, due to the sensible reduction of the cost of their acquisition. In the survey, the PMAs were asked if they used Geographic Information Systems (GIS - SIG for its acronym in Portuguese) and for what purpose. Responses show that fourteen (52%) of the 27 PMAs use GIS for their operational planning (Graph 5). GIS in the PMAs are mainly used to geo-referencing environmental infraction sites and areas of significant interest (e.g., UC polygon, embargoed and reclaimed areas, supervised sites, etc.) and operational planning.

**Graph 5** – Number of PMAs that Use GIS (2018)



**Source:** PMAm, 2018

GIS are indispensable tools for proper operational planning and are affordable (some applications are free). GIS use: in the Center-West region, the states of GO and MT, and DF; in the Northeast, the states of LA, MA and RN; in the North region, the states of CA, RO and RR; in the Southeast, the states of the ES, MG and SP; and in the South region, the RS and SC states.

When asked if they georeferenced the occurrences, the PMAMs of 21 states (78%) answered yes, while only 6 (22%) states did not georefer to the occurrences (in the Northeast region: BA, CE, PE, North: PA). For this geo-referencing, they generally use GPS receivers and/or cell phones.

#### 4.5. INTEGRATION WITH OTHER ENTITIES

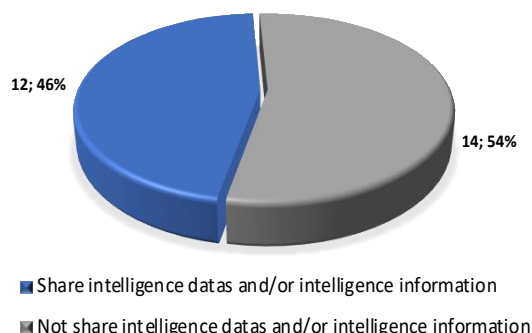
Integration with other areas can take many forms. This part of the research sought to investigate how integration happened. First, by the operational integration using the quantification of joint operations carried out in 2017 by the level of government. Second, integration by sharing data and/or intelligence information, such as names of prisoners, crimes committed, classes and species of animals seized, etc., with other environmental police and/or other environmental agencies. It was found that 89% (5,663) of a total of 6,380 joint operations took place at the state level.

Due to the State's nature, PMAM has provided greater affinity with their peers at the same level of government.

The data showed that greater integration with federal agencies, although representing only 9% of all operations carried out in Brazil, occurred in the Northeast and North regions, where joint operations with IBAMA, ICMBio, the Indian National Foundation (FUNAI for its acronym in Portuguese) and the National Water Agency (ANA for its acronym in Portuguese)<sup>6</sup>. At the state level, the highest frequencies were observed in the Southeast region with joint operations being performed with different entities, while the northern region was highlighted.

Graph 6 frequencies showed that more than half of the states reported not sharing intelligence and/or intelligence information with other agencies (54%).

**Graph 6** – Shared Intelligence Data and/or Intelligence Information between Agencies (2018)



**Source:** PMAM, 2018

Those States that reported sharing intelligence and intelligence (GO, AL, BA, PM, PI, RN, AP, RR, TO, ES, MG and SP), however, did so only with sectors of the same level of government. The exceptions were the states of ES, MG, RR and RN, which also did it with a federal government body (IBAMA). The State of the RN also did it with the municipal guards. However, it should be noted that none of the PMAMs declared that they share data and/or intelligence information among themselves. This is worrying, since environmental crimes committed in a state may have an interstate or even international spread, such as the trafficking of wild animals.

#### 4.6 OPERATING RESULTS

##### 4.6.1. Nature of Occurrences

The PMAMs, although of a hybrid nature, public security police and environmental security police, were predominantly active in the latter. Environmental incidents accounted for 85.2% of all of its occurrence records in 2017. Although its members cover other types of occurrence because of their nature as public security police, common crimes, welfare or

<sup>6</sup> Researchers are aware that the National Public Security Force (FNSP for its acronym in Portuguese)

also supports operations carried out by environmental protection agencies, particularly in the Amazon, although it has not been cited in the questionnaires.



other incidents were not included of their daily routine, since in only 14.8% of the cases non-environmental occurrences were treated.

The characteristic of the PMAs to take care of the majority of environmental occurrences ratifies and reinforces their role as environmental security police. Another relevant finding was a large number of environmental occurrences in that year, 111,834 records. This amount equals approximately the record of one environmental occurrence every five minutes in Brazil by the PMAs.

#### 4.6.2. The Apprehensions

Here we discuss some criminal types of environmental and common crimes, generally more recorded by the PMAs. In the case of crimes against fauna, the seizing or rescue of animals kept illegally in captivity. In the case of crimes against fishing, illegal fishing was investigated using the variables fish (kg) and fishing material seized. In crimes against flora, the variable was the amount of wood seized in cubic meters (m<sup>3</sup>) (Table 4). Also researched was the seizing of other types of materials related to different kinds of non-environmental crimes. The results obtained are described in Table 5.

Table 4 – Apprehensions Related to Environmental Crimes (2017)

REGION	APPREHENSIONS RELATED TO ENVIRONMENTAL CRIMES							
	Seize or rescue of animals	%	Fishing seized (kg)	%	Fishing material seized	%	Wood seized (m3)	%
Midwest	6,613	7.8%	34,648.0	13.7%	25,672	37.0%	16,508.0	9.2%
Northeast	24,996	29.5%	1,760.2	0.7%	6,328	9.1%	669.0	0.4%
North	7,182	8.5%	29,262.6	11.6%	11,830	17.0%	43,245.7	24.1%
Southeast	34,814	41.1%	181,010.2	71.6%	22,176	32.0%	95,847.2	53.5%
South	11,202	13.2%	6,167.0	2.4%	3,392	4.9%	22,855.0	12.8%
Brazil	84,807	100.0%	252,847.9	100.0%	69,398	100.0%	179,124.8	100.0%

Source: PMAm, 2018.

Table 5 - Apprehensions Related to Non-Environmental Crimes (2017)

REGION	APPREHENSIONS RELATED TO OTHER CRIMES					
	Firearms	%	Ammunitions	%	Narcotics (kg)	%
Midwest	438	9.8%	6,017	21.2%	334.4	32.4%
Northeast	439	9.8%	596	2.1%	101.9	9.9%
North	128	2.9%	767	2.7%	8.5	0.8%
Southeast	2,739	61.4%	15,767	55.5%	2.0	0.2%
South	720	16.1%	5,258	18.5%	583.8	56.7%
Brazil	4,464	100.0%	28,405	100.0%	1,030.6	100.0%

Source: PMAm, 2018.

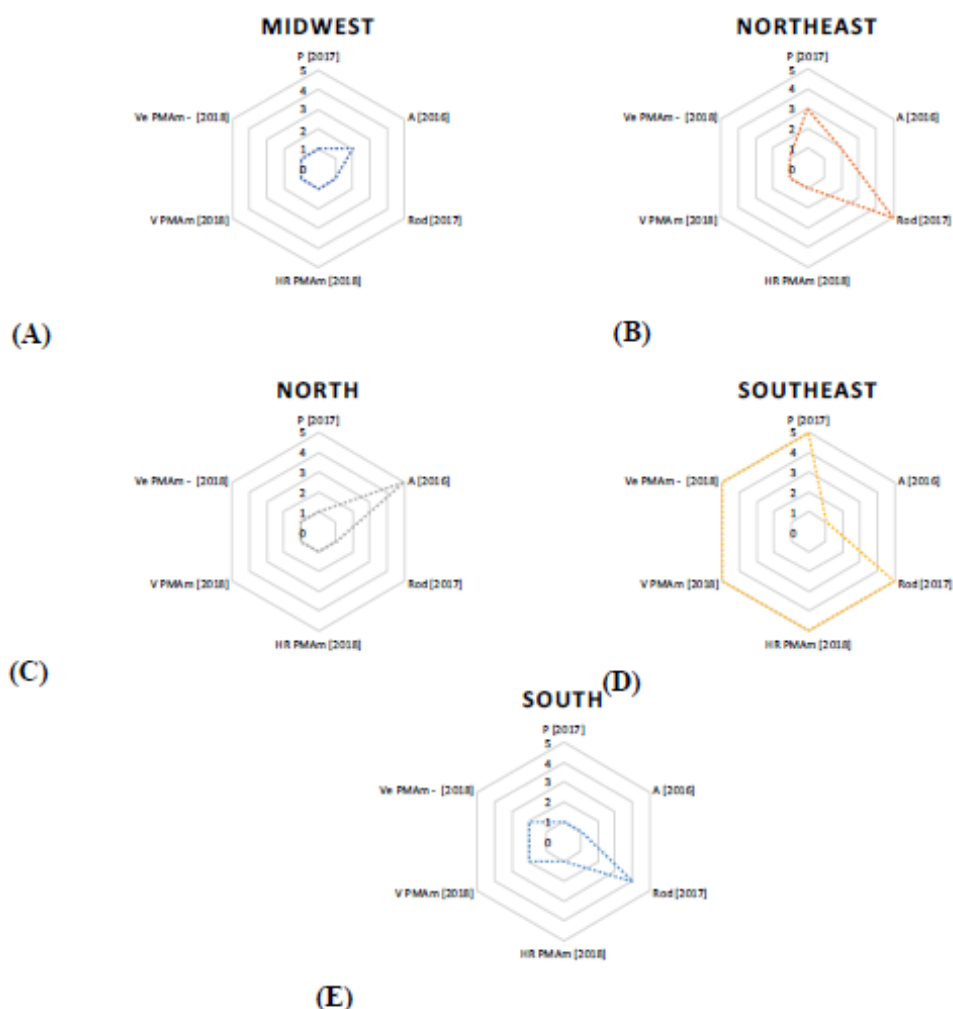
Global warming and anthropogenic changes have been causing impacts on biodiversity through the extinction of species and changes in their habitats. Recent studies have shown that tropical forests can double their loss of biodiversity due to deforestation (Nussenzveig, 2011, Ochoa-Quintero, Gardner, Rosa, de Barros Ferraz, & Sutherland, 2015 and Barlow et al. 2016). However, it has become more shocking to see how Brazilian biodiversity has been destroyed in an accelerated way by the practice of environmental crimes. For example, the rescue or seizing of 84,807

animals held illegally in captivity in 2017 corresponds to approximately one animal being seized every six minutes, ten per hour, 240 per day, and 7,000 per month. The amount of fish apprehended was close to 700 kg per day. The amount of seized wood was equivalent to the volume of more than 70 Olympic swimming pools (25x50x2m) annually. The study only looked at the data of the PMAMs. ICMBio did not provide or did not have such data.

#### 4.6.3. Analysis of Geographical Regions

In the analysis of the Brazilian geographic regions, six variables were initially

**Graph 7 – Brazilian Geographic Regions Analysis**



**Legend:** PMAMs' Human resources in 2018 (HR PMAm [2018]); PMAMs' vehicles in 2018 (V PMAm [2018]); PMAMs' vessels in 2018 (Ve PMAm – [2018]); estimated population in 2017 (P [2017]), territorial area in km<sup>2</sup> (A [2016]); extension of roads in km (Rod [2017]).

Source: Authors 2018



identified that could more directly impact the policing and environmental controls carried out by the PMAs. As for the PMAs related, the first was the human resources in 2018 (HR PMAm [2018]) (See Table 1), followed by vehicles (V PMAm [2018]) and other vessels (Ve PMAm - [2018]) (See Table 2). Three other socio-geographical variables that could influence these activities served as parameters for comparison with the first three. The estimated population in 2017 (P [2017]), the territorial area in square kilometres (A [2016]) and the extension of roads in km (Rod [2017]) were the variables chosen since they are directly related to the first three.

The variables had different and incomparable units of values. The Sturges technique was used to homogenize and classify the values of the variables. In this technique, the numbers of sample elements (five geographic regions) relate to the number of classes to be estimated. Subsequently, the upper and lower limits of each interval were established, identifying the absolute and relative frequencies of each class (FERREIRA, 2014).

Graph 7 shows that the Midwest (A), Northeast (B) and North (C) regions are the most vulnerable to PMAs surveillance. Even though the North region was the most vulnerable because of its greater territorial extension, an attempt was made in the previous years to increase the human resources of the PMAs, as observed in Table 1, an opposite trend of other Brazilian geographic regions. It is important to highlight here the importance of the Amazon Forest and the Pantanal Sul-Mato-Grossense for local, regional, national and global homeostatic balance, maintenance and conservation of biodiversity, among others.

Associated with the deforestation and loss of biodiversity in the Brazilian Amazon there is still the risk of its “savannization” due to the process of clearing-burning-pasture-livestock, which intensifies by more than three times the process of canopy loss by the invasion of the forest fire

(SILVERIO et al., 2013). Research indicates that in the Midwest region market pressures for agricultural commodities for urban consumption and biofuel production increase pressure on forests (DEFRIES et al., 2013).

Another worrying factor has been the change in deforestation patterns, which some authors attribute as a reaction to the field operations developed by IBAMA. The amount of small deforestation (between 6.25 and 50 hectares) increased between 2002 and 2009, from 30% to 73% of all deforested areas in MT, PA and RO, making remote sensing and surveillance difficult (ROSA; SOUZA; EWERS, 2012). In the Legal Amazon, deforestation increased by 73% between May 2017 and May 2018. Of this total, 44% were in areas under special protection regimes, such as UC (30%), agrarian reform settlements (13%) and the indigenous lands (1%) (FONSECA et al., 2018). The dry rainforest, as Cerrado e Caatinga have been suffering from historic patterns of land use and cultural practices that favor livestock farming over other less environmentally damaging activities (ESPÍRITO-SANTO et al., 2009).

## 5. CONCLUSIONS

Many police organizations may be reluctant to admit that environmental problems are outside the main scope of their constitutional mission. Police forces, mainly the Brazilian gendarmerie for being responsible for ostensive policing, are increasingly being charged for public safety issues. For this reason, they direct their primary efforts to the most immediate public safety needs.

Environmental issues, however, are not exclusive to this approach. On the contrary, they are subjects related to human survival, but the average human being is not wholly aware that services promoted by nature are essential to their healthy quality of life.

In this research, it was demonstrated that the SPC and SISNAMA

are dynamically interconnected. They are what, in theory, is called the Environmental Safety System (SSA for its acronym in Portuguese). Changes in one or the other system promote impacts at local, regional, national, transnational or global scale. Disasters caused by extreme weather events can promote looting waves to homes or commercial establishments. The scarcity of a natural resource causes social conflicts to increase due to their dispute, adding a new dimension to the attributions of the security forces. Migrations caused by armed conflicts, natural disasters or anthropogenic interventions, various degradations, and disputes over natural resources promote the displacement of thousands of people in Brazil, creating an urbanization bomb. City, countryside and natural areas constitute a single continuum of territory, and the lack of knowledge about the dynamic interconnections between SSA entities can promote an undervaluation of services developed by environmental units by their mother corporations, governments and society.

This results in the need to internalize environmental costs in the area of public safety. The intersection between the SPC and SISNAMA occurs mainly with the PMAs. These specialized police forces have a dual function: the public security police and the environmental security police. Its hybrid feature is not common in countries with tradition and expertise in UC administration.

The PMAs are present throughout the national territory. Its total staff amounted to 7,252 which is equivalent to almost eight times the number of ICMBio servers with inspection attribution. As a result of the logistics-operational structure, the study pointed out that the vast majority of all vehicles and vessels are concentrated in the Southeast and South regions, and the Midwest, Northeast and North are the most deprived of these resources. Air patrolling is performed by only 11 (41%) of all PMAs, and the UAVs are used for environmental monitoring by nine (33%) of them.

GIS is used by 14 (52%) of the 27 Brazilian PMAs, which basically do it to geo-referencing environmental infraction sites, areas of greatest interest and operational planning. Police incidents are geo-referenced in 21 states. In some cases, the work identifies a lack of conceptual knowledge of what a GIS is.

The operational integration of the PMAs occurred, in general, with the organs of the different levels of government. Data sharing and/or intelligence information occurred in 12 (46%) of the states, and only with state agencies. On the other hand, PMAs do not share data and/or intelligence information with each other. This is worrying, since environmental crimes may have an interstate or international spread.

Operating results are impressive. The nature of the occurrences reached by the PMAs is mostly environmental (85.2%). This data ratifies and reinforces its role as environmental security police. The environmental occurrences during the year 2017 totalled 111,834 records, which is equivalent to an incident registered every five minutes in Brazil, only by the PMAs.

The study shows that Brazilian biodiversity has been dilapidated. For an idea of magnitude, the amounts are equivalent to the seizure of approximately one animal every six minutes, 700 kg of fish per day and the equivalent of the volume of more than 70 Olympic-sized wooden swimming pools annually.

The administrative notifications are enforced by only 11 of the 27 PMAs. The fines imposed by the ICMBio have the average value much higher than those practised by the state environmental police units. A delegation of competence would enhance the actions of those PMAs that do not yet impose fines, in addition to adding another environmental protection instrument. This decentralization of competences has the potential to reduce deforestation, especially in the North region where fewer notifications are carried out by state environmental forces (573).

Only eight states (30%) the PMAs have an application for incident management, which in itself justifies the development of a geocollaborative application for the other 19 corporations since the citizen and the average military police do not recognize the environmental offences as criminal offences. In the analysis of the geographical regions, it can be seen that the Midwest, Northeast and North are the most vulnerable from surveillance by PMAs.

The operational activities of the PMAs present some weaknesses as follow: a human resources reduction of 25% in the last four years, the actual decreases and quantities of vehicles and vessels in some regions, the lack of integration, the lack of standardization in the collection of data with other levels of government and among the PMAs that operated uncoordinated and disconnected from each other.

It also includes the lack of an application and a geoprocessing sector in most of the environmental police forces. The non-disclosure of its main operating results at the national level, making it impossible for its services to be measured and valued, the hybrid police function of public safety and environmental security, which often makes its members employed in other types of policing than environmental policing, as well as not setting them in those units by promoting transfers to other conventional police units.

Environmental gendarmeries, although providing extremely relevant environmental services, suffer from the lack of a national public policy to deal with environmental crimes and articulation between environmental inspection agencies that operate without integration, disconnected and locally. The true reality indicates that this model is not the most suitable for the conservation of our natural resources and biodiversity. The loss of doctrine, due to the turnover of personnel due to the transfers, is very detrimental to the development of the activity of environmental inspection, which is highly specialized.

Brazil lacks an environmental protection force such as those found in

countries with higher expertise and tradition of protected areas, with complete police cycle for crimes committed in-situ. The lack of such protection force is compromising national biodiversity. Also, the federal environmental inspection agencies should be a catalyst, promoter and diffuser of the doctrines of environmental inspection, to seek standardization in the collection and dissemination of data to give visibility to environmental crimes. Integration begins with information sharing. Publicity and accountability is a duty of the public administration.

A critical window of opportunity emerged for the PMAs and other environmental watchdogs which is the institution of the National Policy on Public Security and Social Defense (PNSPDS for its acronym in Portuguese) in July 2018, which states that the protection of the environment is one of its principles and established the public safety actions and policies that preserve the environment (Brazil, 2018b), nevertheless it has not listed any environmental entity as a strategic and operational component. From the PNSPDS can emerge doctrines and standardization of procedures for the collection and dissemination of data. This once again demonstrates the lack of awareness among public administrators of the dynamic and systemic relations existing in the SSA.

These actions would promote the strengthening of PMAs and other environmental agencies, as well as bringing benefits to the environment as a whole and to public safety indirectly, reducing conflicts over the possession or use of natural resources and internal displacement. The preservation of the environment would mitigate the damages caused by extreme climatic events, reducing their impacts on public safety.

The subject of public safety presents an abundant scientific work yet; there are a few publications on environmental monitoring, environmental protection or environmental monitoring in the environmental military police cut. When they

do, the cut generally comprises federal environmental law enforcement agencies.

This research is a new, timely, contemporary subject with little-systematized knowledge about it, and rich in future explorations. Brazilian geographic regions need further analysis, and the concept of an environmental safety system needs to be better investigated and established. The research on the existing sources of funding for PMAMs and their origins is an essential task, as well as it is inevitable to seek the

spatial autocorrelations between environmental criminal phenomena and socio-geographical variables. It also needs to examine GM's environmental clusters such as: where are they, how effective they are, how they act, how they are trained etc. All of these topics are examples of future work that could be developed from this study.

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## UMA ANÁLISE CRÍTICA DO SISTEMA DE SEGURANÇA AMBIENTAL BRASILEIRO

**RESUMO:** Os conflitos decorrentes da disputa por recursos naturais estão aumentando. Os eventos climáticos extremos estão se intensificando e se tornando mais frequentes devido ao aquecimento global. Embora as consequências desses fenômenos tenham reflexos na segurança pública, os processos de análise incorporando a dimensão ambiental nesse contexto não foram completamente compreendidos. Este artigo avaliou-se como os sistemas de proteção ambiental se interconectam com o sistema de prevenção da criminalidade, formando o sistema de segurança ambiental. É uma pesquisa exploratória-descritiva realizada por meio de questionários com avaliação dos órgãos de fiscalização ambiental a nível estadual, explorando oito principais domínios: suas origens; seus efetivos, distribuição e organização; suas estruturas logísticas e operacionais; o emprego de geotecnologias; a integração; os resultados operacionais; a análise regional e a análise geral das polícias militares ambientais. Destaca-se que as polícias militares ambientais devam ser as maiores forças de proteção da natureza do País. Revela-se ainda que existem pontos fracos e oportunidades de melhorias a serem implementadas.

**Palavras-chave:** Fiscalização ambiental. Proteção ambiental. Monitoramento ambiental. Polícia militar. Comando e controle