

Environmental surveying systems and effectiveness of actions in the Brazilian Amazon

Sistemas de vigilancia ambiental y efectividad de las acciones en la Amazonía brasileira
Sistemas de fiscalização ambiental e efetividade de ações na Amazônia brasileira

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Abstract

Weak governance over the Brazilian Amazon is jeopardizing both social and environmental balance. Moreover, the loss of this balance can have severe social, economic, and political consequences at local, national, and global levels. Therefore, we plan to answer how the Brazilian forest is being protected based on the perspective of the environmental military police integrating all states of the so-called Legal Amazon. The study came from a field survey conducted through a questionnaire sent to those police agencies. The research is based on exploratory and descriptive methods of qualitative and quantitative approach with both field research and literature review on the subject. We sought to evaluate publications that satisfactorily described the “state of the art” of the main research on the topic, as we strove for the quality and comprehensiveness of the research, and a field survey through a questionnaire applied to law enforcement agencies. The responses were organized into four groups, allowing an overview of the environmental inspection in the region. Although the Amazon Rainforest is the largest tropical rainforest in the world, it has been found that states in the region devote little human and material resources to its protection.

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They are insufficient, tactically, and strategically under-employed, poorly distributed, and for the most part, far below the national average, which is already lower than recommended by international bodies which dedicate to the protection of nature.

Keywords: Amazon; Military Police; Environmental Security; Environmental Inspection.

Resumen

La débil gobernanza en la Amazonía brasileña está poniendo en riesgo su equilibrio socioambiental. Más aún, la pérdida de este equilibrio puede tener graves consecuencias en los ámbitos social, económico y político, a nivel local, nacional y mundial. De ahí que busquemos responder cómo se protege a la *hileia* brasileña bajo el prisma de la acción de la policía militar ambiental en los estados que conforman la Amazonía Legal. La investigación se basa en métodos exploratorios descriptivos con un enfoque cualitativo y cuantitativo, con investigación de campo y revisión de literatura sobre el tema. Intentamos evaluar publicaciones que describieran satisfactoriamente el “estado del arte” de las principales investigaciones sobre el tema, haciendo hincapié en la calidad y el alcance de la investigación, y la encuesta de campo a través de un cuestionario aplicado a las agencias policiales. Las respuestas se organizaron en cuatro grupos, lo que permitió elaborar una visión general de la fiscalización ambiental en la región. Aunque la selva amazónica es la selva tropical más grande del mundo, se evidenció que los estados de la región dedican pocos recursos humanos y materiales a su protección. El análisis muestra que son insuficientes, mal empleados desde un punto de vista táctico y estratégico, mal distribuidos y, en la gran mayoría, muy por debajo del promedio nacional, que ya es inferior al recomendado por las agencias internacionales de protección de la naturaleza.

Palabras clave: Amazonía; Policía Militar; Seguridad ambiental; Inspección Ambiental.

Resumo

A fraca governança na Amazônia brasileira está colocando em risco o seu equilíbrio socioambiental. Ainda, a perda desse equilíbrio pode promover severas consequências nos campos social, econômico e político, a níveis local, nacional e global. Com este estudo buscou-se responder como a floresta brasileira está sendo protegida sob o prisma das polícias militares ambientais dos estados integrantes da Amazônia Legal. A pesquisa está baseada em métodos exploratório-descritivo de abordagem quali-quantitativa com pesquisa de campo e revisão da literatura sobre o tema. Buscou-se avaliar publicações que descrevessem de forma satisfatória o “estado da arte” das principais pesquisas em torno do tema, primando pela qualidade e abrangência das pesquisas e levantamento de campo por meio de questionário aplicados à órgãos policiais. As respostas foram organizadas em quatro grupos, permitindo traçar um panorama da fiscalização ambiental na região. Embora a Floresta Amazônica seja a maior floresta tropical úmida do planeta, identificou-se que os estados da região dedicam poucos recursos humanos e materiais à sua proteção. Eles são insuficientes, mal-empregados do ponto de vista táctico e estratégico, mal distribuídos e, na sua grande maioria, em número muito inferior à média nacional, que já é inferior ao recomendado por órgãos internacionais de proteção da natureza.

Palavras-chave: Amazônia; Polícia Militar; Segurança Ambiental; Fiscalização Ambiental.

Introduction

Environmental crimes have become the fourth largest criminal activity in the world. This type of transnational crime moves around \$91 billion (US dollars) at least, involving products extracted from forest and wildlife. In terms of financial earnings in regard to criminal activity, environmental crimes are only ranked below drug trafficking (US\$ 344 billion year), forgery crimes (US\$288 billion year) and human trafficking (US\$157 billion year) (Nellemann, Henriksen, Kreilhuber, Stewart, Kotsovou, Raxter, Mrema and Barrat, 2016).

Environmental crimes are well organized and usually are associated with other types of crimes. There is a wide variety of criminal acts related to environmental crimes, such as falsification of public documents, corruption, land grabbing of public and private areas, tax evasion, homicide, and so on. As a result, environmental crimes have become one of the most significant threats of this century, to the extent of threatening humanity in different ways, such as by increasing the demand for natural resources, and by widening the existing economic gap between nations, peoples, and societies. This type of crime also promotes migration and immigration disparities, which negatively impact human security on a global scale (Coats, 2019).

Such crimes do not occur any differently in the Amazon. However, most of them are invisible to the public authorities in charge of battling them. Amazonian socio-environmental conflicts stem from disputes over access to land, waters, and natural resources, involving forest, faunistic and fishing issues. Furthermore, law enforcement officials fail to guarantee the right of those traditional holders of those resources – especially on indigenous lands, against possible invasions of their territories by non-accredited persons or companies. All due to either lack of resources or lack of interest. One of the consequences of such lack of command and control is violence, which has made Brazil the world leader in the rate of murders of environmental activists, most of them in the Amazon region (Rapozo, Radaelli and Conceição da Silva, 2019).

The Amazon, the largest Brazilian biome, and the largest tropical rainforest in the world, is not immune to such threats. On the contrary, it has been the target of illegal activity in recent decades, not only due to the abundance of resources, such as timber, ores and fish, but also for its megadiverse fauna, which holds more than five thousand species (Brasil, 2018a). This megadiversity needs to be protected; however, command and control bodies have been unable to provide an adequate response to mitigate these crimes.

The Amazonian environmental monitoring system is exercised by various law enforcement and operative command bodies. There are agencies not associated with the police, but with law enforcement powers, which perform a specialized service. For example, the Brazilian Institute of Environment and Natural Resources (IBAMA for its acronym in Portuguese) and the Chico Mendes Institute for Biodiversity Conservation (ICMBio for its acronym in Portuguese) and their state and municipal counterparts. These agencies have their legal provision established by the National Environment System (SISNAMA for its acronym in Portuguese) (Brasil, 1981), which, in turn, structure all protection and improvement of the environment at all levels of government (federal, state, and municipal).

In addition to these, there are typical police institutions that fall within the concept assigned by Bayley (2017, p. 20), i.e., organizations or “persons authorized by a group to regulate interpersonal relationships within this group through the application of physical force”, and with responsibility to patrol, investigate, control traffic, promote internal control and assist the population. Within this concept are the Federal Police (PF for its acronym in Portuguese), Federal Highway Police (PRF for its acronym in Portuguese), the National Force of Public Security (FNSP for its acronym in Portuguese), the state civil police (PC for its acronym in Portuguese), the state military police (PM for its acronym in Portuguese) and the municipal guard (GM for its acronym in Portuguese).

It remains unclear, however, how the protection of the Amazon is really being developed. Some questions emerge from this obscurantism, such as the quality and quantity of agents assigned to this protection and how they are articulated. The primary purpose of this research is to evaluate how environmental inspection is developed by the environmental military police (PMAm for its acronym in Portuguese) in the Legal Amazon.

The comand and control agencies

Specialized Agencies

IBAMA

IBAMA is a federal entity subordinated to the Ministry of the Environment to exercise environmental police power, as well as licensing activities and monitoring environmental quality. It also authorizes and oversees the use of natural resources, monitors and control environmental quality and executes the supplementary actions of the Union (Brasil, 1989). The Amazonas (AM) state has a territorial area of more than 1.5 million Km² large, and in 2014 the IBAMA had only 47 agents for inspection (Severiano, 2014), which is equivalent to one agent for each block of 33,100 Km². In the state of Pará (PA), the ratio of agents was one for each block of 7,998 Km² of the area to be overseen (Ungar, 2017).

To get an idea of the gap in the number of IBAMA agents in the Amazon region, two states out of the nine states that make up the Legal Amazon will be taken as an example. First the state of AM. It has a territorial extension of more than 1.5 million Km², where the agency had only 47 agents to inspect it in 2014 (Severiano, 2014), which amounted to one agent for each block of 33,100 Km². Second, the state of PA. which holds an area of approximately 1.25 million Km², where the proportion of agents was of one for each block of 7,998 Km² of area to be overseen (Ungar, 2017).

ICMBio

ICMBio is another Union autarchy, also linked to the Ministry of the Environment. It's responsible for executing nation-wide conservation units (UC for its acronym in Portuguese) policies and the sustainable use of renewable natural resources. It is also responsible for supporting extractivism activities in favor of traditional populations, fostering and carrying out research, exercising the environmental police power of the Union in the UCs, executing and promoting recreation programs, such as the public use and eco-tourism. ICMBio works in coordination with other agencies and entities involved, at the UC where such activities are permitted (Brasil, 2007).

Among the activities set out for the implementation of national policies of UC that are relevant to this research, the protection and monitoring of these federal areas should be highlighted. ICMBio has a staff of 921 inspectors, i.e., those with the power to impose fines for the performance of activities of protection, inspection, and monitoring of all the Brazilian UCs. In the Amazon, this contingent has about 288 inspectors for overseeing 118 federal UCs, totalling approximately 605 thousand Km². This is equivalent to a ratio of one inspector per 2,100 Km² (ICMBio, 2019; Cabral de Oliveira, Silva, and Oliveira Júnior, 2020).

Cunha e Menezes (2015) highlight in their research the proportion of rangers in some countries of the Americas, whose data are summarized in Table 1. Also, he stressed that, according to the International Rangers Federation (IRF) the proportion of adequate park-rangers for effective protection of an area under a special regime of protection, such as a UC, would be a park-ranger for every 100 square kilometers (1/100 Km²).

Table 1. Average Ratio of Park-Rangers per Km² of Protected Area

Country	IRF	Guatemala	Panamá	Nicaragua	Honduras	EUA	Brazil (Amazon)	
							UC Federal	UC State
Average ratio of park-ranger (Km ²)	1/100	1/73.63	1/111.84	1/125.26	1/222.01	1/82	1/1,700	1/1,872

Source: Cunha e Menezes, 2015.

Protection tends to be more intensive when there is a greater risk of species extinction. The International Union for Conservation of Nature (IUCN) suggested that for the species critically endangered, such as the African rhinos, the ideal ratio for intensive protection zones and sanctuaries should be at least one ranger to an area between 10 and 30 Km², and reserves with area above 200 Km² the staff should also be supported by anti-poaching units (APU) (Emslie and Brooks, 1999).

The number of rangers per protected area may be questioned. It depends on several factors, such as the category in which the UC is classified, the anthropogenic pressure to which it is subjected, the number of visitors it receives, including the extinction risk to which a species is subjected. However, the ratio of the Brazilian park-ranger per Km², at the national and state levels, has rankings much lower than the other American countries, and the recommended standards by international organizations specialized in the protection of nature.

State and Municipal Specialized Agencies

In addition to the federal executing bodies, IBAMA and ICMBio, the SISNAMA designates as state and municipal executing bodies what they call sectional and local bodies, (Brasil, 1981). These agencies are also in charge of developing programs, controlling, and monitoring the environment in their jurisdictions.

Finding out the total number of agents with these organs is a very difficult data to obtain. Perhaps, because governments, at whatever administrative level, do not wish to show the fragility of their command and control systems. However, recently the Vice-President of the Republic, Antonio Hamilton Martins Mourão, has declared that both IBAMA and ICMBio currently have half of their expected agents, and that not all of them work in the Amazon (Vilela, 2020). It is empirically estimated that the Brazilian sectional and local agencies, mostly, present similar conditions to the federal executing bodies (or maybe worse), which have greater resources.

The Police

The Federal Police

The Federal Police (PF for its acronym in Portuguese) is the judicial police of the Union, and its assignment is to investigate the crimes committed against the Union and its agencies. For example, to curb trafficking, stop illicit narcotics and other drugs, as well as perform the maritime, airport and border police duties, (Brasil, 2016a). The PF has been deploying an increasing number of operations in order to achieve its legal obligation. Therefore, it went from having 18 operations in 2003 to 550 operations in 2016 (Brasil, 2019).

The Environmental Crime Fighting Division is the PF sector specializing in investigating environmental crimes. The PF carried out a total of 24 major operations against illegal deforestation in Amazonia between 2010 and 2015, resulting in 659 search warrants and 415 arrests. The PF also has access to the Amazon Protection System (SIPAM), which provides information in real-time

and financial support for its operations (Becker, 2016). The investigations observed a direct link between deforestation and influential criminal organizations. Moreover, they showed that the network of crimes is not restricted only to the extraction and illegal trade in forest products, but also includes that of mineral substances and precious stones, all of it happening with the involvement of politicians, high-level public agents, entrepreneurs, and landowners (Ungar, 2017).

It is estimated that around 70% of all Brazilian timber exported is of illegal origin. These practices are fueled by high priced *commodities* that reach the international market, as well as fraud in the forest concessions, in management plans, and forest origin document (DOF for its acronym in Portuguese) (Ungar, 2017).

Deforestation itself has a low penalty combination, only three months to one year and fine (Brasil, 1998). However, while committing such offences, criminals commit other crimes associated with the provision of more severe penalties, such as corruption, falsification of public documents, money laundering and conspiracy, whose sanctions may exceed 30 years in prison. However, the law has only reached the weakest links in this chain: chainsaw operators, factory workers, truckers, and miners (Ungar, 2017).

The Federal Highway Police (PRF for its acronym in Portuguese)

The PRF is another permanent police institution, constitutionally guaranteed and maintained by the Federal Government to promote ostensive patrol on federal highways (Brasil, 2016a). The PRF has performed a vital role in intercepting illegal transport of wood, animals wild, coal, ore, fish, dangerous goods etc. To get an idea of this amount, between 2012 and 2017 85,854 animals, 59,441m³ of coal and 329,340 kg of fish were seized by the PRF on Brazilian federal highways (Brasil, 2018d).

The National Force of Public Security

The United Nations Peace Forces inspired the FNSP. It is a contingent made up of public officials from the areas of safety and civil defence of the states and the Federal District. It provides the Union to support the federal entities in cases of preservation of public order, security of citizens and property, as well as in the case of calamities (Brasil, 2007b).

The FNSP has one Environmental Operations Company, which is specialized in environment protection actions. The whole of FNSP corps has around 2000 members, plus another body of about ten thousand servers that can be called in case of emergency. However, a company usually has a staff of approximately 100 soldiers. Over 12 years (2004-2016), the FNSP has carried out a total of 234 operations of all types. Although, only 41 of them were environmental

activities, such as support to IBAMA, ICMBio, and ecological disasters, and 7 operations were fire brigade actions (Marinatto, 2017; Brasil, 2018c).

For these operations, the federal government has invested approximately R\$ 1.3 billion, on an average of R\$ 5.6 million per operations, 80% of this amount (R\$ 1.05 billion), goes towards the payment of daily expenses of its regular members (Marinatto, 2017). In addition to those expenses, the FNSP was supported in 2015 by the Amazon Fund (R\$ 30 million) to structuring its Environmental Operations Company to operate in the Amazon (Brasil, 2018d).

The State Civil Police (PC for its acronym in Portuguese)

The PC state is entrusted with the exercise of the state and the Federal District judicial police, as well as the investigation of crimes, except the militaries (Brasil, 2016a). They have created specialized services in order to attend social demands. Thus, they were created police stations specializing in investigating specific types of crime, such as organized crime, illicit drug trafficking, money laundering and environmental crimes as well.

In the Amazon, they are of crucial importance concerning about environmental crimes that occur in the region. This relevance was recognized in the Plan of Action for Prevention and Control of Deforestation and Burning in the Cerrado (PPCerrado for its acronym in Portuguese), and Plan of Action for Prevention and Control of Deforestation in the Legal Amazon (PPCDAm for its acronym in Portuguese): phase 2016-2020. In which was established that one of the lines of action to be prioritized would increase the capacity of investigation of environmental crimes by one of its key actors, the PC (Brasil, 2018b).

The State Military Police

The State Military Police (PM for its acronym in Portuguese) is part of the set of police institutions provided by the Brazilian Constitution, in charge of the ostensive policing and the preservation of public order. The military characteristic of these institutions made them the Brazilian Army's reserve force in case of war. However, they are hierarchically controlled by state governors¹ (Brasil, 2016a).

They possess a kind of specialized policing dedicated to protecting the environment that is held by PMAm. The national staff of this specialized military police in 2017 consisted of over 7000 members. In the same year, they were responsible for more than 131,000 occurrences, 111,834 (85.2%) of which were related to environmental crimes; 11,730 only in the Legal Amazon. This number of incidents was equivalent to environment crime being recorded every five minutes. In addition, they seized more than 84,000 animals illegally held in captivity, about 253 tonnes of illegal fish and nearly

180,000 cubic meters of illegally harvested wood. This was equivalent to one animal being seized every 6 minutes, about 700 kg of illegal fish caught per day and the annual volume of 70 Olympic swimming pools of illegal wood (Cabral de Oliveira *et al.*, 2020).

The PMAMs have a dual role as members of the state military police: the public security police and the environmental security police. Although they predominantly act as environmental safety police on 85.2% of records, this hybrid function has pros and cons.

On the one hand, the massive force, the secure deployment of troops, their national distribution, the military organization and the ability to operate in any biome or environment are some of the advantages that these dual functions provide. On the other hand, this hybrid function has a significant disadvantage: their corporations prioritize the activities of public security police over those of environmental security police, and they are not uncommon for their members to be applied to other ordinary types of policing of urban areas (Cabral de Oliveira *et al.*, 2020).

This, however, is no anomaly, since the police in modern states have been designed to policing in cities since Rome under the ruling of Emperor Augustus (27th century BC) (Bayley, 2017). The etymology of the word “police,” which is the *pólis, eōs* in Greek or *polis* in Latin, dating back to the meaning of the “city” or “city state”. Other Greek and Latin radicals also originated the word “police” such as *politeía, as* and *polítia, ae*, respectively, with the same idea of political organization, government, quality and rights of citizens, life and management of statesman etc. (Houaiss, 2007; Torgerson, 2003).

Moreover, these types of specialized policing have lower number of staff members than those that are part of the primary responsibilities of these organizations, which are: policing, investigating, traffic control, conducting internal administration and providing assistance to citizens (Bayley, 2017). However, it was found that there was a significant variation in the percentage of active personnel of Brazilian PMs that was dedicated to environmental policing (between 0.33 and 6.5% in 2018). Even when an analysis of the actual staff of PM as a whole between the years 2013 and 2016 was measured, it was found that there was virtually no fluctuation (-0.02%), while in PMAMs, the total workforce was reduced by around 20% between the years 2014 and 2018. It was also suggested that the active force of PMAMs was transferred to the common activities of urban policing (Table 2).

Table 2. Comparison Between the Active Staff Members of the PM (2013 and 2016), the Personnel of the PMAm (2014-2018) and the Rates of Intentional Violent Deaths per 100 thousand Inhabitants (2017)

Federation Unit	Number of Active Staff Members of Military Police Force			Total Number of Personnel of Environmental Military Police			Percentage of Personnel of Environmental Military Police		Rate of Intentional Violent Deaths (MVI) per 100,000 inhabitants (2017) (5)
	December 31, 2013 (1)	December 31, 2016 (2)	% change from 2013 to 2016	Number of Personnel of Environmental Military Police, 2014 (3)	Number of Personnel of Environmental Military Police, 2018 (4)	% change from 2014 to 2018	2014 in relation to the Military Police's Active Staff Members 2013	2018 in relation to the Military Police's Staff Members 2016	
AC	2.712	2.432	-10,32%	48	39	-18,75%	1,77%	1,60%	63,9
AL	7.135	6.976	-2,23%	162	113	-30,25%	2,27%	1,62%	56,9
AM	9.050	9.239	2,09%	110	125	13,64%	1,22%	1,35%	31,3
AP	3.700	3.365	-9,05%	---	120	---	---	3,57%	55,8
BA	31.039	31.350	1,00%	---	105	---	---	0,33%	45,1
CE	15.926	16.367	2,77%	---	238	---	---	1,45%	59,1
DF	14.345	13.139	-8,41%	537	118	-78,03%	3,74%	0,90%	18,2
ES	8.491	9.746	14,78%	219	205	-6,39%	2,58%	2,10%	37,4
GO	11.950	11.667	-2,37%	208	209	0,48%	1,74%	1,79%	39,3
MA	7.709	8.893	15,36%	110	92	-16,36%	1,43%	1,03%	29,4
MG	42.115	41.399	-1,70%	2.414	997	-58,70%	5,73%	2,41%	19,6
MS	5.255	5.478	4,24%	329	356	8,21%	6,26%	6,50%	20,8
MT	6.579	7.915	20,31%	181	162	-10,50%	2,75%	2,05%	31,5
PA	15.943	14.809	-7,11%	198	157	-20,71%	1,24%	1,06%	53,4
PB	9.263	9.183	-0,86%	129	146	13,18%	1,39%	1,59%	31,9
PE	19.348	18.532	-4,22%	140	126	-10,00%	0,72%	0,68%	57,3
PI	5.335	5.936	11,27%	75	63	-16,00%	1,41%	1,06%	20,2
PR	17.465	21.755	24,56%	543	493	-9,21%	3,11%	2,27%	22,6
RJ	46.135	45.789	-0,75%	285	305	7,02%	0,62%	0,67%	40,4
RN	8.926	8.327	-6,71%	56	128	128,57%	0,63%	1,54%	68,0
RO	5.200	5.266	1,27%	184	206	11,96%	3,54%	3,91%	28,1
RR	1.669	1.911	14,50%	---	28	---	---	1,47%	44,0
RS	20.405	19.104	-6,38%	461	290	-37,09%	2,26%	1,52%	26,7
SC	11.560	10.887	-5,82%	355	396	11,55%	3,07%	3,64%	16,5
SE	4.660	5.018	7,68%	38	36	-5,26%	0,82%	0,72%	55,7
SP	89.478	86.882	-2,90%	2.128	1.864	-12,41%	2,38%	2,15%	10,7
TO	3.855	3.778	-2,00%	156	135	-13,46%	4,05%	3,57%	26,6
Brazil	425.248	425.143	-0,02%	9.066	7.252	-20,01%	2,13%	1,71%	30,8
Average	15.750	15.746	1,81%	394	269	-6,46%	2,41%	1,95%	

Source: (1) IBGE, 2015, (2) IBGE, 2016, (3) Moreira *et al.*, 2015, (4) Cabral de Oliveira, 2018, (5) Fórum Brasileiro de Segurança Pública, 2018.

The PM, however, is demanded by society to preserve public order in the cities (Bayley, 2017; Soares, 2019). This was evident when comparing the relationship between two variables by Pearson's correlation coefficient: as independent variable was used the rate of intentional violent deaths (MVI for its acronym in Portuguese)² per 100 thousand inhabitants in 2017, while the dependent variable was the percentage of personnel of PMAm in 2018 in relation to the PM's active staff members in 2016 (Fig. 1).

Pearson's correlation coefficient (= -0.359, with a 95% confidence interval) indicated that there is a negative correlation between those variables (Ferreira, 2014). Thus, it means that the higher the rates of intentional violent deaths, the lower the percentage of active staff members that PM devoted to environmental policing. These data suggest that the own existence of PMAm is threatened if public safety conditions in urban areas continue to deteriorate.

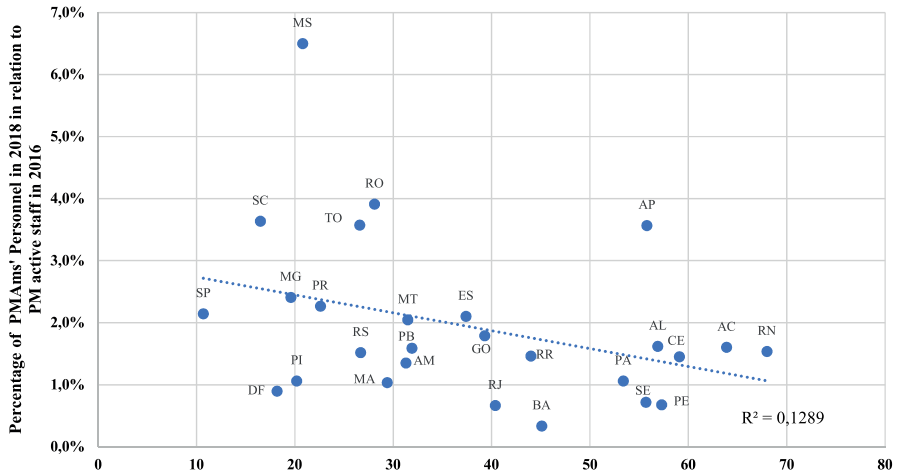


Figure 1. Scatter Chart of Correlation Between Intentional Violent Death Rates (2017) and the Percentage of PMAm's Personnel (2018) in Relation to PM Corporations' Active Staff Members (2016)
Source: The authors, 2019.

The Municipal Guards

The Federal Constitution of 1988 created the municipal guards (GM for its acronym in Portuguese). They are inserted in the chapter that deals with public security (Art. 144), indicating that they integrate this system with the police. However, it is not required by law that municipalities create them (Brasil, 2016a). Consequently, in 2014, they were present only in about 19% of Brazilian cities. This percentage has been increasing annually since the existence of a GM is a prerequisite for towns to access the funds of the National Public Security Fund (IBGE, 2015). Note, however, that not all of them have a division specializing in environmental protection.

The Judicial Interpretation

Another problem that agencies and police face is the legal interpretation of environmental crimes. Brazilian law considers the vast majority of environmental crimes to be of the least offensive potential, where a perpetrator has rarely been imprisoned. For this reason, judges prefer to apply administrative and civil laws, which are seldom paid. Less than 1% of all administrative fines imposed for deforestation were paid (Ungar, 2017). The case study of Cabral de Oliveira *et al.* (2018a) supports this statement. They found out that in the state of Rio de Janeiro, only 4% of all people arrested for an environmental crime by PMAm were convicted in 2014. These results diffuse a significant sense of impunity and render the actions of command and control agencies ineffective, demotivating their members.

Paradoxically, as crime rates rise, less attention is paid to environmental damage. These, in turn, promote further deterioration of the environment, reducing the quality of life in large cities, suggesting a further increase in crime and social conflicts. These dynamic interconnections encourage negative feedback on the variety of life levels of every society. This conflict is continuously experienced by police organizations, as they have the dilemma of protecting the environment for future generations or ensuring the survival of city dwellers. Therefore, they are favouring the urban policing, because when the survival of today is still in doubt, and the material and human resources are scarce, the future is what matters least.

The ability to deal with this dilemma will determine how much natural resources and biodiversity this generation will leave for the next. Recognizing and accepting the existence of systemic interconnections between crime prevention and environmental systems is the first step in this paradigm shift.

State Corruption

Another problem faced by environmental agencies and the police is their own agents. Unfortunately, Brazil is among the group of countries above the world average when it comes to corruption. According to Transparency International, Brazil ranks 106th, tied with six others (Albania, Algeria, Cote d'Ivoire, Egypt, North Macedonia, and Mongolia) in a ranking of 180 countries (Transparency International, 2020).

When corruption reaches the management of natural resources, it has the potential to slow the development of a country. The sectors in charge of the management of natural resources may present corrupt practices, which can be facilitated, owing to the high values involved in their exploitation, the isolation of the operations that are triggered, and the discretionary power attributed to state agents. Thus, the corrupt attitudes practiced by such agents erode the policies of management of natural resources, reduce the collection of taxes and fees, cause damage to the environment, undermine trust in the State, and increase socioeconomic inequalities (Le Billon and Williams, 2017).

The practice of acts of corruption by public agents in charge of the management and protection of Brazilian natural resources frequent are quite often on the pages of newspapers. In the state of AM, for example, two agents with the Amazon Environmental Protection Institute (Ipaam) were arrested for charging bribes from a businesswoman in order to free her from an environmental fine (Monteiro, 2018). The following year, 22 people among employees with that same institution, as well as entrepreneurs, farmers and forest engineers were charged by the Federal Public Prosecutor's Office for irregularities in the granting and supervision of forest management plans (Ministério Público Federal, 2019).

The Secretary of State for the Environment of MT was arrested for defrauding the rural environmental registry (CAR for its acronym in Portuguese) in order to facilitate deforestation (Rodrigues, 2018). IBAMA's officials, military police officers and farmers were arrested by the PF in AC, AM and Minas Gerais (MG) for promoting deforestation, invading protected areas and threatening residents ('Servidores' do Ibama e fazendeiros são presos em operação contra crimes ambientais no Acre, 2019). For this reason, tougher controls should be taken in order to cease corrupt practices adopted by some of its agents, which, in turn, undermine the country's sustainable development.

Methodology

To achieve the objectives of this research, the methodology used was based on data obtained through a field survey conducted by semi-structured questionnaires, that were sent to all nine PMAMs of the member states of the Legal Amazon, from January to March 2019, to draw an overview of the structure of environmental inspection performed for those bodies (Gil, 2016). Also, documentary and bibliographic studies were produced.

Bibliographic research used the bibliometric mining technique, which consists of producing an indexed search of the article's keywords and the terms that reproduced them in English, as shown in Table 3. In this search, the keywords and thesauri were searched one at a time, followed by a combinatorial analysis of the same two by two, three by three and finally all together by Boolean operators from the Scopus (Elsevier) database during September 2019. The search was restricted to the most cited peer-reviewed journals of the last five years (Redondo, Leon, Povedano, Abasolo, Perez-Nieto and López-Muñoz, 2017).

Table 3. Keywords and their Thesauri in English

Keyword	Thesauri in English
Amazonia	Amazon; International Amazon
Polícia militar	Military police; law enforcement; gendarmerie
Segurança ambiental	Environmental security
Fiscalização ambiental	Environmental inspection; environmental overview; environmental supervision

Source: The Authors, 2019.

The data obtained from the questionnaires were tabulated and gathered according to the Brazilian state political-administrative division. In the exploratory analysis of the Legal Amazon member states, the Sturges technique (Ferreira, 2014) was used to homogenize the different types of variables. The results are expressed in the next section of the research.

Results and discussion

Geospatialization of PMAMs in the Legal Amazon

The state PMAMs have two major commands (Cmdo for its acronym in Portuguese), eight battalions (Btl for its acronym in Portuguese), 18 companies (Cias for its acronym in Portuguese), two independent companies (Cia Ind for its acronym in Portuguese), nineteen platoons (Pel for its acronym in Portuguese), nine detachments, three environmental policing groups (GPA for its acronym in Portuguese) and a nucleus for the environmental policing of the Legal Amazon. These units are spatially distributed, as shown in Figure 2.

The geospatialization between the PMAM headquarters of the member states of the Legal Amazon is of crucial importance for this research. They form a geographic network that may or may not contribute to the development of environmental inspection. Since the interaction between headquarters, subordinate subunits and territories occurs mainly by land, it is directly related to the concepts of movement, distance, and time, impacting the effectiveness of policing. Thus, we have that the greater the spatialization of the units and nodes of this network, the higher the interaction with the territory, and theoretically, the higher the effectiveness of environmental supervision.

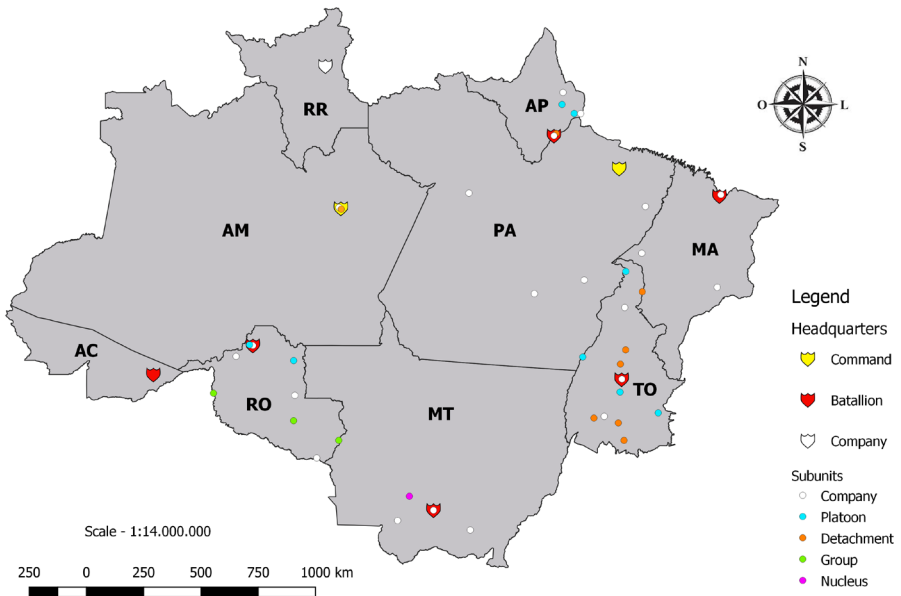


Figure 2. Map of Geospatialization of PMAM Units in the Legal Amazon
Source: Instituto Homem Pantaneiro, 2019; adapted by the Authors, 2019.

The states of AC, AM, AP, and RR concentrate their environmental police force in or near the state capitals, while MT does so to the south, and PA to the east and southeast. The state of RO distributes its subunits close to its borders, as well as the state of MA, which has two subunits near its western borders and the eastern boundary of the legal Amazon, and another in its capital, São Luís. The TO is the state that it has the best geospatialization, with subunits evenly distributed throughout its territory.

The total number of PMAMs in the Legal Amazon has been increasing since 2014. It grew from 987 members in 2014 to 1,229 in 2019. This variation corresponds to an increase of approximately 20%. This was a positive fact since between 2014 and 2018, the Brazilian PMAMs had their numbers reduced at the same level (20%). However, the average of environmental military police officer per protected Km² (PM / Km²) in most states is still much lower than the national average of 2018 for one environmental military police officer per block of 1,173.58 Km² (Table 4).

Table 4. Number of Environmental Military Police Officers and their Proportion per Km² Protected

Legal Amazon's States	Abbreviation	Area in km ² (2017)	Personnel of PMAM			Number of Active Staff Members of Military Police Force in December 31st, 2016	Percentage of Personnel of Environmental Military Police in 2019 in relation to Active Staff Members of Military Police Force in 2016	Area (km ²) per Environmental Military Police Officer (2019)
			2014	2018	2019			
Acre	AC	164.123,74	48	39	47	2.432	1,93%	3.491,99
Amapá	AP	142.828,52	---	120	144	3.365	4,28%	991,86
Amazonas	AM	1.559.146,88	110	125	131	9.239	1,42%	11.901,88
Maranhão	MA	331.936,95	110	92	90	8.893	1,01%	3.688,19
Mato Grosso	MT	903.202,45	181	162	173	7.915	2,19%	5.220,82
Pará	PA	1.247.955,24	198	157	233	14.809	1,57%	5.356,03
Rondônia	RO	237.765,29	184	206	260	5.266	4,94%	914,48
Roraima	RR	224.300,81	---	28	26	1.911	1,36%	8.626,95
Tocantins	TO	277.720,41	156	135	125	3.778	3,31%	2.221,76
Amazônia Legal		5.035.747,80	987	1.064	1.229	57.608	Average 2,45%	Average 4,097,44
Amazônia Legal (average)		---	141	118	137	6.401	2018: 1,71%	Average 2018: 1,173,58
Brasil		8.510.820,62	9.066	7.252	---	425.143	2018: 1,71%	Average 2018: 1,173,58

Source: IBGE, 2016, Moreira et al., 2015, Cabral de Oliveira, 2018.

The number of environmental military police officers in the Legal Amazon varies widely, not only in terms of their active staff members, but also in the percentage of these that they devote to environmental policing, and in the proportion of police officers per Km² to be protected (Table 4). Moreover, there is another gradient of values when comparing these proportions with of park-rangers in the Americas and Brazil by protected area (Table 1), and in the proportions recommended by international nature protection bodies (IRF - 1/100 Km², IUCN - 1/10-30 Km²).

A note must be made. The park-rangers were calculated, taking into consideration the area of UCs, as it is the jurisdiction where they have police power. While in proportion to the number of environmental military police officers, the total area of the territory was considered, since they have a dual function: public security police and environmental security police.

The proportion of IBAMA agents in AM (1 agent/33,100 Km²) and PA (1 agent /7,998 Km²), for example, is still much lower than that of environmental military police officers in the same states: AM (1 PM/11,901.88 Km²) and PA (1 PM/5,536.03 Km²). The survey also pointed out to other relevant data: the Km² blocks protected by the PMAs in Brazil (1 PM / 1,173.53 Km²) are smaller than those under the responsibility of the UC agents at both levels of federal governance (1 agent /1,700 Km²) and state (1 agent /1,872 Km²), as well as in the case of ICMBio in the Amazon (1 agent /2,100 Km²).

Most states that are members of the Legal Amazon, on the one hand, have proportions of environmental military police officers per block of Km² (1 PM/4,097.44 Km²) lower than the national average of the PMAm (1 PM /1,173.53 Km²). On the other hand, they devote, on average, a higher percentage of their active staff members to environmental policing (2.45%) than the Brazilian average in 2018 (1.71%). Elsewhere in this study, reference was made to the controversy over the adequate number of agents needed to oversee an area under special protection. An excellent example to look at is the case of Canada.

The Canadian National Parks Service, *Parks Canada*, for example, has about 80 rangers deployed solely and specifically to oversee approximately 450,000 Km² of protected areas in their various UC categories (Parks Canada Agency, 2019). This amount is equivalent to 1 park-ranger for every 5,625 Km². However, researchers visiting this agency in 2016 found that these rangers are equipped with satellite cellphones, military-standard computers and accessories, digital cameras and GPS receivers, general service equipment, firearms, personal protective equipment (PPE) and uniform. The total amount of equipment available to each Canadian ranger amounts to CAD 12,000 (twelve thousand Canadian dollars). Furthermore, they use goetechnologies, have an intelligence network, which even uses information from the *Inuit* (indigenous peoples of the Arctic) and always have at their disposal support at least 4 hours away, which can be carried

even by helicopter. Thus, in this case, technology and the intelligence system provided the most significant demand for human resources.

The lack of a specific environmental intelligence service that includes the national, state and municipal agencies, police and society proved to be one of the most significant weaknesses of the Brazilian environmental inspection system, since it prevents qualified criminal prosecution. Currently, they can be developed based on geo applications that use the Geocollaboration and citizen science, where smartphones could be used to save species and to report environmental crimes, optimizing the actions of command and control agencies (Preece, 2017; Cabral de Oliveira, 2018).

Suggesting a suitable force for the environmental inspection of the Legal Amazon is neither an easy task, nor the objective of this research. However, this was an issue that dogged the researchers from the survey data. Considering the national average of the environmental military police officers (1 PM /1,173.53 Km²) and a current number of 1,229 of them in the Legal Amazon, we tried to adjust the amounts of states that were below this average. Very conservatively, a total of 4,416 military environmental police officers were reached, without considering any other variables (Table 5).

The exception is the AP and RO states, which currently devote the largest percentage of their active staff members to environmental protection (Table 5), so that the other states could reach the national average of environmental military police officers their numbers should be: AC=140; AM=1,329; MA=283; MT=770; Pará=1,063; RR=191; and TO=237. Although these quantities may seem feasible to a Brazilian reality, they still fall short of those practiced in other countries of the Americas (Table 1) and those suggested by international nature protection bodies (IRF - 1/100 Km² , IUCN - 1/10-30 Km²), and are expected to be very difficult to achieve in the short term for two main reasons.

First, because the MVI rates of two-thirds of the states of the Legal Amazon are above the Brazilian average (30.8 per 100,000 inhabitants), which is already high compared, for example, with the average homicide rate of the member countries of the “Organization”. Economic Co-operation and Development (OECD), which is 3.7 per 100,000 people (OECD Better Life Index, 2019).

Second, for that to happen, it would be necessary for these states to increase their active staff members in their military police forces or to devote a more significant percentage of their existing personnel to environmental policing, passing in some cases, such as the AM state of 1.42% to 14.38% of the operative force. This is equivalent to applying to this type of policing a force ten times larger than the one currently employed. This seems unlikely to occur for the reasons already given.

In the next section, we will analyze other variables capable of establishing an overview of the situation of the states that are part of the Legal Amazon.

Table 5. Suggested Number of Environmental Military Police Officers per Km²

Legal Amazon's States	Abbreviation	Area in km ² (2017)	Total Number of Personnel of PMAm (2019)	Staff Members suggested considering the National Average of PMAm Personnel	Number of Active Staff Members of Military Police Force	Percentage of Personnel of Environmental Military Police in 2019 in relation to Active Staff Members of Military Police Forces in 2016	Area (km ²) per Environmental Military Police Officer (suggested)	Rate of Intentional Violent Deaths (MVI) per 100,000 inhabitants (2017)
Acre	AC	164,123.74	47	140	2,432	5.75%	1,173.58	63.9
Amapá	AP	142,828.52	144	144	3,365	4.28%	991.86	55.8
Amazonas	AM	1,559,146.88	131	1,329	9,239	14.38%	1,173.58	31.3
Maranhão	MA	331,936.95	90	283	8,893	3.18%	1,173.58	29.4
Mato Grosso	MT	903,202.45	173	770	7,915	9.72%	1,173.58	31.5
Pará	PA	1,247,955.24	233	1,063	14,809	7.18%	1,173.58	53.4
Rondônia	RO	237,765.29	260	260	5,266	4.94%	914.48	28.1
Roraima	RR	224,300.81	26	191	1,911	10.00%	1,173.58	44
Tocantins	TO	277,720.41	125	237	3,778	6.26%	1,173.58	26.6
Amazonia Legal		5,035,747.80		4,416	57,608	Average: 7.30%	Average: 1,140.34	Average: 40.4
Amazonia Legal (average)		---	118	491	6,401	Average: 1.71%	Average: 1,173.58	Average 2017: 30.8
Brasil (2018)		8,510,820.62	7,252	---				

Source: IBGE, 2016; Fórum Brasileiro de Segurança Pública, 2018; the authors, 2019.

Overview of the State Members of the Legal Amazon

The panorama of the member states of the Legal Amazon was established from the analysis of 15 variables that were separated into four groups according to their functional characteristics. The groups of variables are: (1) sociogeographic, (2) operational logistic, (3) geotechnological, and (4) structural. The variables of these groups were obtained from two sources. One primary, which was from the field survey carried out through questionnaires. The other source originated from secondary data collected from the research by Cabral de Oliveira (2018) that included all Brazilian PMAMs. The first group, sociogeographic variable, contains a single variable: the rate of MVI per 100,000 inhabitants.

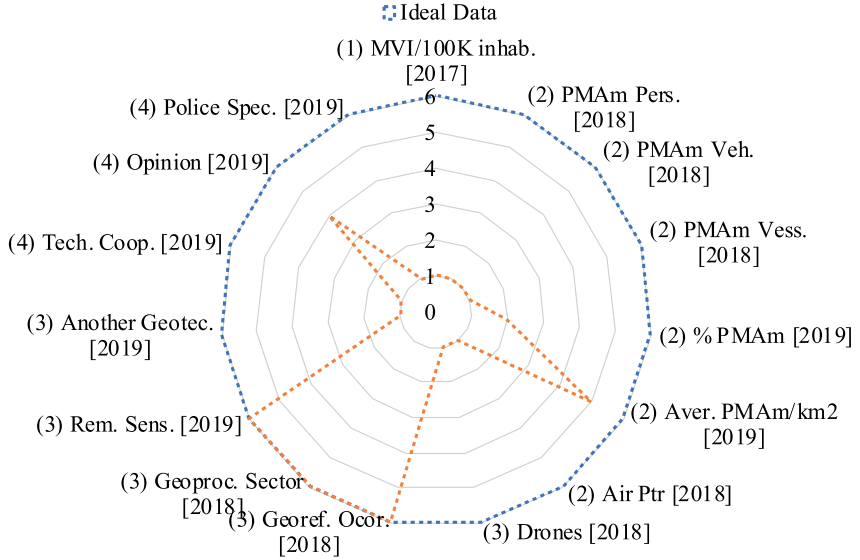
The group of operational logistic variables include those that most interfere with environmental policing, such as the number of environmental military police officers, the number of vehicles, the number of vessels, the percentage of active staff members of the corporation dedicated to environmental policing in PMAM, the average proportion of environmental military police officers per Km², and air patrols are carried out.

The geotechnological variables relate to the use of geotechnologies by the PMAMs, such as: if they use drones to patrol areas or georeference occurrences through GPS, if the PMAM unit has a geoprocessing sector, if they use remote sensing, and if they use any another geotechnology.

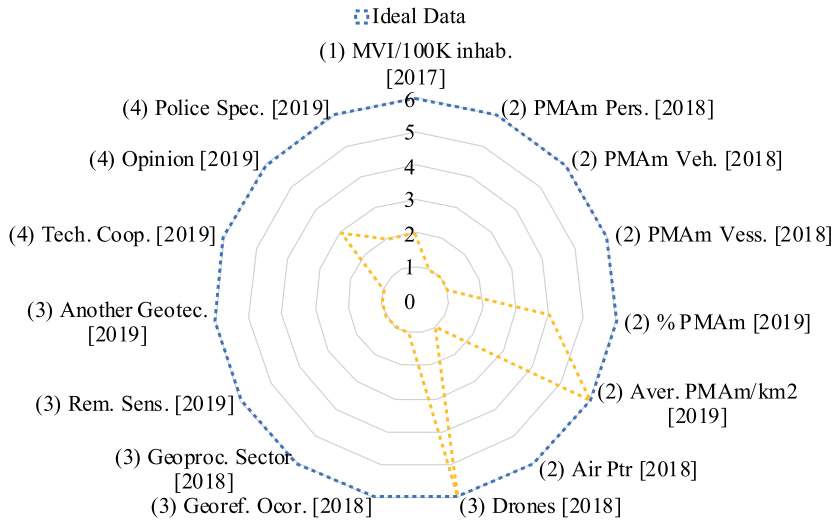
Finally, the structural group concerns the variables that support policing activities, such as the existence of technical cooperation between PMAM and the state environmental agency, PMAM's opinion about the state environmental agency's performance, and whether there is a police station specialized in investigating environmental crimes and how it works.

Then the class data were grouped by state and compared with the data considered ideal, according to the reality of Brazilian PMAMs. The results are shown in figure 3.

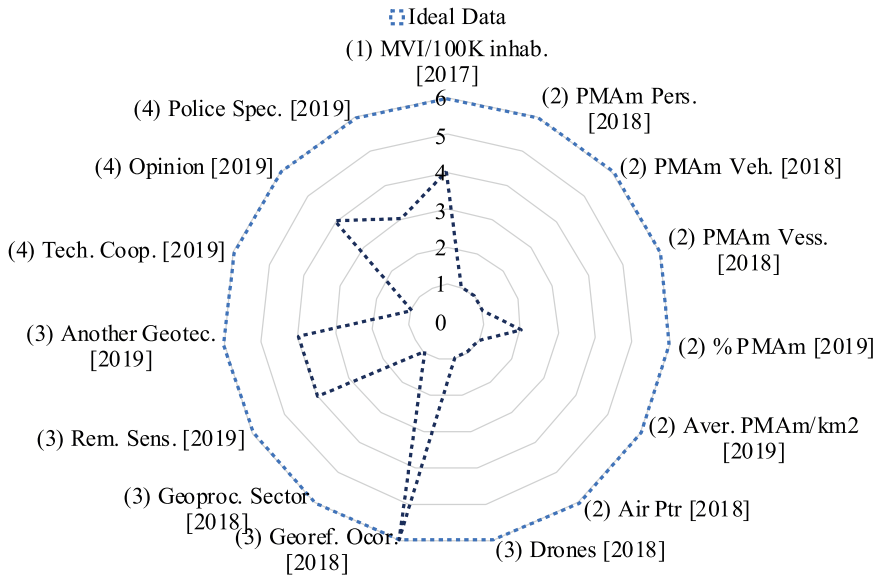
ACRE



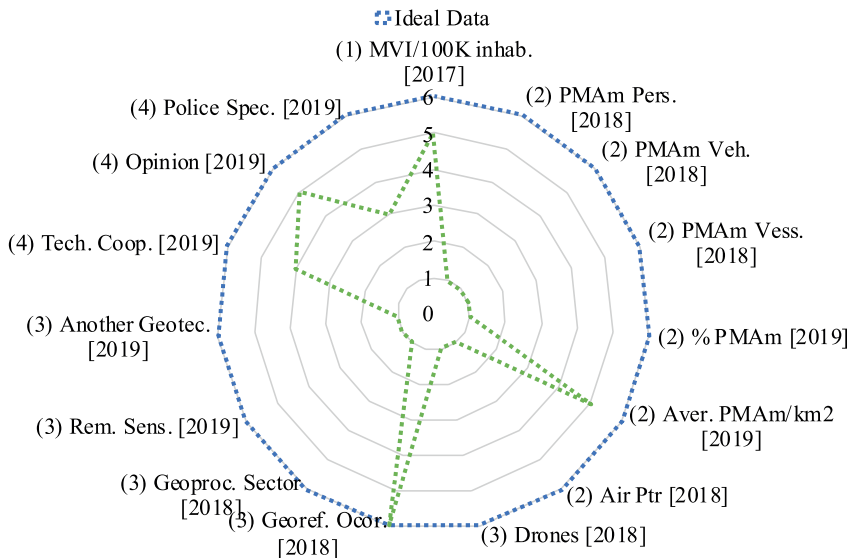
AMAPÁ



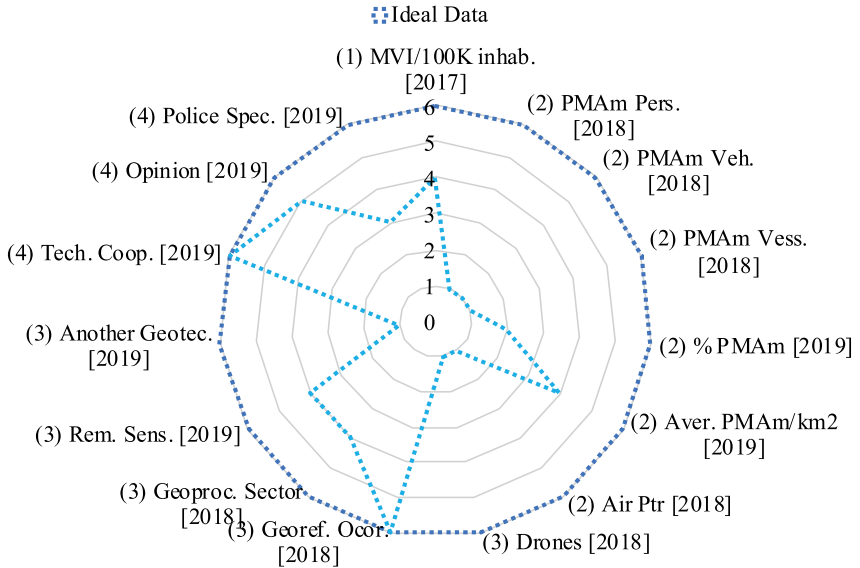
AMAZONAS



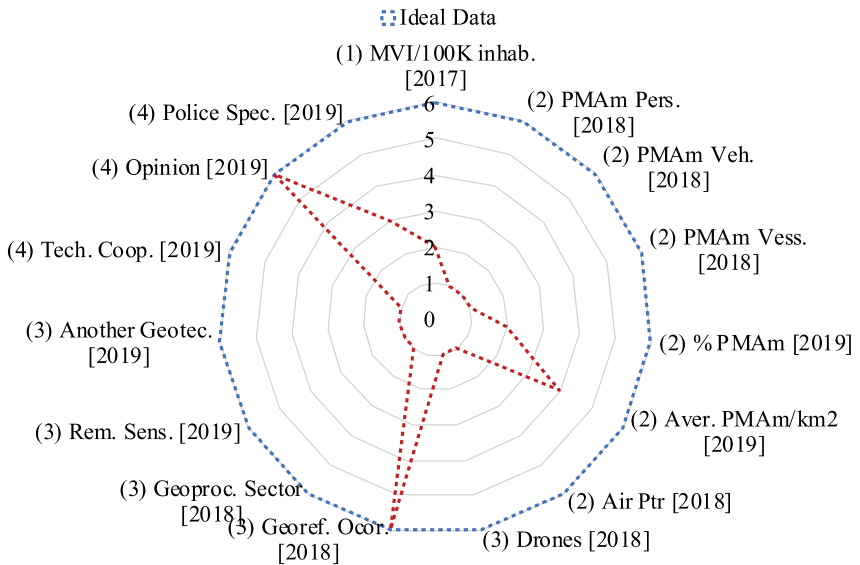
MARANHÃO



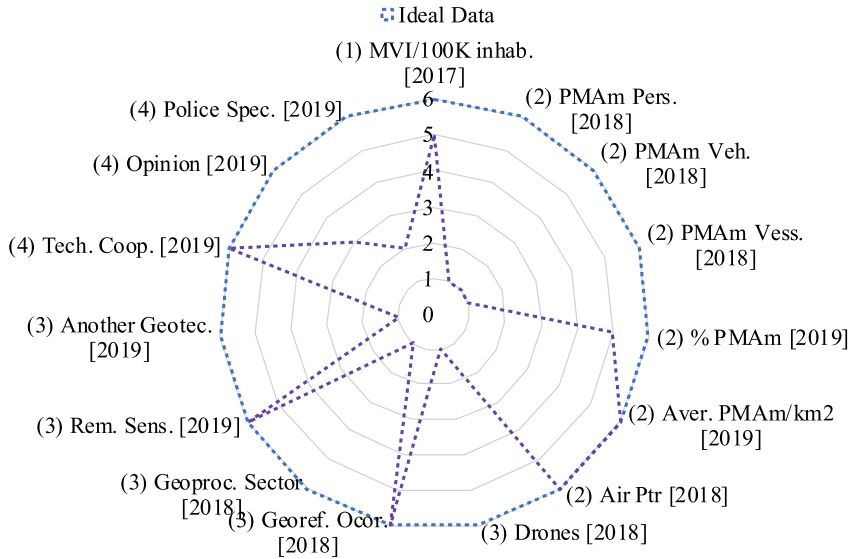
MATO GROSSO



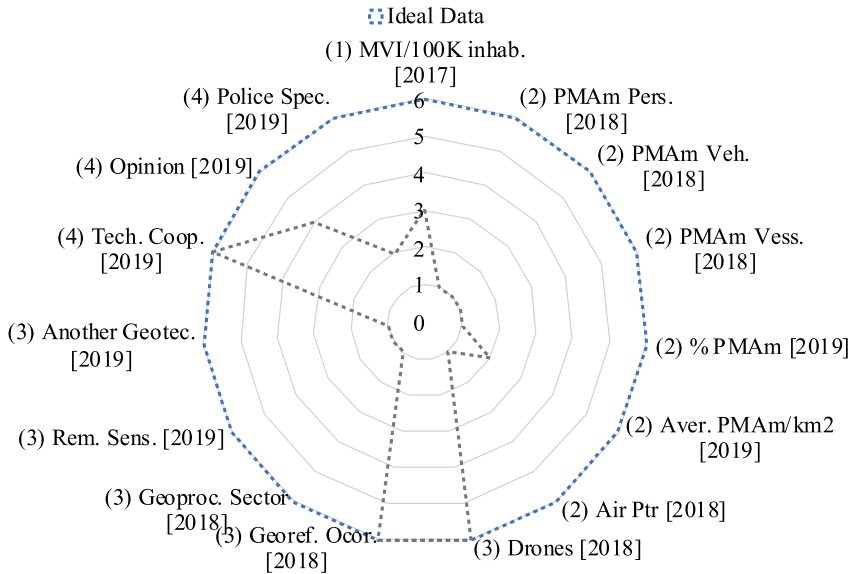
PARÁ

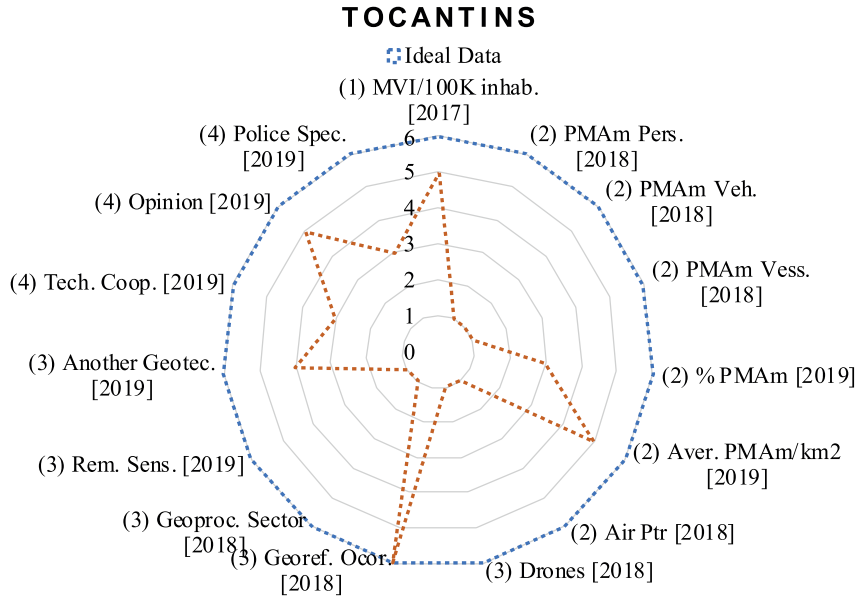


Rondônia



Roraima





Legend:

Group	Variable	Description
(1)	MVI/100K inhab. [2017]	Rate of MVI per 100,000 inhabitants in 2017
(2)	PMAm Pers. [2018]	PMAm's personnel in 2018
	PMAm Veh. [2018]	PMAm's vehicles [2018]
	PMAm Vess. [2018]	PMAm's vessels in 2018
	% PMAm [2019]	% of active staff members in 2016 dedicated to environmental policing in PMAm in 2019
	Aver. PMAm/Km ² [2019]	Average proportion of environmental military police officers per Km ²
	Air Ptr [2018]	Carring out of air patrolling in 2018
(3)	Drones [2018]	Using of drones in 2018
	Georef. Ocorr. [2018]	Georeferencing occurrences in 2018
	Geoproc. Sector [2018]	Factual geoprocessing sector in 2018
	Rem. Sens. [2019]	Use of remote sensing in 2019
	Another Geotec. [2019]	Use of any another geotechnology in 2019
(4)	Tech. Coop. [2019]	Factual technical cooperation between PMAm and environmental state agency in 2019
	Opinion [2019]	PMAm's opinion about the state environmental agency's performance in 2019
	Police Spec. [2019]	Factual police station specialized in investigating environmental crimes in 2019

Figure 3. Analyse of Legal Amazon's states
 Source: The Authors, 2019.

The states with the lowest rates of MVI (1) (highest classes) are the states of MA, RO, and TO. All others have rates above the national average. Regarding the operational logistic variables (2), it can be seen that the states of the Legal Amazon include the smallest personnel, number of vehicles and vessels among the PMAMs in Brazil. However, when checking the percentage of the active staff members they devote to environmental policing, two states stand out with significant proportions considering the national scenario: AP and RO, as well as the latter is the only one that conducts air patrols in the region. While the best ratios of environmental military police officers per Km² are also found in these same states: AP (1 PM / 991.86 Km²) and RO (1 PM / 914.48 Km²).

Regarding geotechnological variables (3), it was found out that two states use drones (AP and RR), and one does not georeference occurrences (AP). Only two have a geoprocessing sector in the own PMAM head office (AC and MT). AC, AM, MT, and RO states use remote sensing. Only AC and RO do so in the own headquarters, and AM and TO use thematic maps, but are produced in a different location than their units. However, the lack of professionals with geotechnology skills and competences is a deficiency that Brazilian military police have been facing for a long time (Brazilian Public Security Forum, 2016). Thus, the presence of a geoprocessing sector would be a stimulus to the training of these professionals.

The structural variables (4) present the dimension of integration with the state environmental agency, the opinion of the PMAM about the performance of these agencies and the functioning of the police stations specialized in the investigation of environmental crimes. This research shows that five states have some degree of technical cooperation with the environmental agency (MA, MT, RO, RR and TO). However, only in the states of MT, RO and RR, there is the delegation of competence of the environmental administrative police power, which allows them to exercise their full environmental police power.

The states of MA, MT, PA and TO consider the performance of the state environmental agency (sectional) effective or very effective. This last aspect is surprising, since MT and PA states are among those with the highest deforestation rates. For the other states, this action is ineffective or ineffective. Except for the AC state that does not exist, all other states have only one police station specialized in investigating and prosecuting environmental crimes. In addition, they are all located in the capitals of their respective states, mostly far from the main areas of illegal deforestation, and operate only on business days, on business hours or part-time. All sectors involved in inspection need to function correctly for the full exercise of environmental protection.

In the present study, the states were not compared with each other, since the existence of a lower class in a given variable can be compensated by another variable with a higher class, leading to inconclusive results. Take,

for example, the state of AM. While on the one hand, it has the lowest ratio of military environmental police per Km² (1 PM /11,901.88 Km²), it also uses a good deal of geotechnologies such as GPS for incident recording and remote sensing; which is very useful mainly for identifying areas with illegal deforestation, burning or mining. On the other hand, it has its units concentrated in the metropolitan region of its capital, Manaus. With few logistical resources, such as vehicles, boats, and helicopters, it is difficult to move troops to inspect the most remote and distant areas of the capital, such as the southwest of the state, where the largest illegal deforestation areas are present.

When it comes to deforestation, the characteristics vary according to each state. The states that stand out most in this type of environmental crime are MT, PA, RO and AM. The states of AM and PA are the ones with the worst indicators among the states of the region. However, MT has geospatialization of its concentrated units to the south of the state, when deforestation occurs in the north, which makes inspection difficult. Although the MT's PMAm was awarded to funds from the Amazon Fund for the construction of an integrated operations center in the municipality of Colniza (Brazil, 2016b), and the work was already completed by the end of July 2019 this unit has not yet been put to work because the operation had a lack of staff. The curious thing is that between 2013 and 2016, PMMT had a 20.31% increase in its number of active staff members. It is indicating that urban policing was prioritized since the state has the rate of MVI (31.5) higher than the national average (30.8), which confirms the findings presented in Figure 1.

The PPCerrado and the PPCDam - phase 2016-2020, do not mention the PMAm at any time. Contradictorily, this same plan points out to environmental inspection as one of its main instruments to mitigate illegal deforestation (Brasil, 2018b).

The inspection actions of law enforcement agencies proved as key players in the success in the reductions in illegal deforestation rates, combined with other initiatives such as Reducing Emissions from Deforestation and Forest Degradation, plus (REDD+). On the other hand, researchers who made these discoveries only took into account the actions of agencies of federal environmental inspection specialized (Hargrave and Kis-Katos, 2013; Börner, Wunder, Wertz-Kanounnikoff, Hyman and Nascimento, 2014). In these surveys, the environmental military police were invisible protectors of nature.

Another interesting finding was that, although they had few vehicles and boats, the primary means of travel for inspection adopted by the PMAm was the road. Nevertheless, most illegal deforestation has been observed along roadways, particularly unofficial roads, and rivers (Barber, Cochrane, Souza, and Laurance, 2014), suggesting that somehow this policing has not been effective, highlighting the importance of good dispersion of environmental

policing units on the ground, as well as the use of remote sensing geotechnologies and the use of faster means of transport such as helicopters in order to reduce the time-space of state response.

What unveils is that most states in the Legal Amazon devote few resources to effectively enforcing environmental monitoring. Whether it is for the PMAMs, their state environmental agencies or their PCs to investigate and crackdown on environmental crimes, although most of the Amazonian lands are under state enforcement powers (85.6%). With this, they promote an overload on federal inspection agencies (Schmitt and Scardua, 2015). However, this lack of resources may also be associated with the involvement of public and political actors, and those of high economic power, which are not interested in strong and effective environmental overview, with interagency integration and coordination, as they would be the most harmed due to their involvement in the commission of such offences.

This overload in services and the lack of staff of the federal supervisory bodies led the central government to make use of the so-called “law and order guarantee operations” (GLO for its acronym in Portuguese) in the region of the Legal Amazon during the years 2019 and 2020. Such operations are provided for in the Brazilian Constitution (Brasil, 2016) and are intended to regulate the performance of its Armed Forces (FA) in typical public security actions, or in the border strips, at sea and in the inland waters against cross-border and environmental crimes (Brasil, 1999). Although the effectiveness of these operations is not fully understood, since, even with GLO operations in 2019 deforestation rates in the Legal Amazon were the highest in the last ten years according to the Brazilian Institute of Space Research (INPE for its acronym in Portuguese) (INPE, 2020). However, its importance cannot be denied, mainly due to the huge border strip existing in the region.

Another problem that emerges from the performance of FA is its limitation. The decrees that regulated the operations in the years 2019 (Brasil, 2019) and 2020 (Brasil, 2020) limited actions to the areas of union surveillance competence, such as border strips, indigenous lands and federal conservation units. The FA’s performance in areas of state competence, which were seen is the majority (85.6%) in the Legal Amazon would be conditioned to the request of each state governors. Thus, for an effective supervision of the Amazon region, a multiscale integration is necessary, involving the three levels of government, as well as all stakeholders, including academia and civil society in all forms of representation.

Thus, the data presented here should be seen as opportunities for improvement as a whole in state and national environmental inspection and policing actions, as well as provoking concerns, bringing it to the forefront of the debate and shedding light on the work of the PMAMs and its role in nature conservation.

Final considerations

Throughout this study, it can be identified that the lack of a national nature protection force is proved to be detrimental to the Brazilian ecosystem balance. Only a national body would have the capacity to integrate and coordinate interagency environmental protection actions, making them significantly more efficient, and less susceptible to local political influences and interests. Currently, this integration is weak or nonexistent, sporadic and often different organs are acting in the same region without communicating, wasting efforts and resources, which are already scarce.

Moreover, none of the police agencies or institutions devote adequate human and material resources to the complicated activity of overseeing and patrolling an area as large as the Amazon. However, there is neither medium-term nor long-term perspective of creating such a force. Thus, it is suggested a permanent integration of the three administrative spheres of government (federal, state and municipal) and not only punctual, as in the joint action in major natural disasters, such as landslides, floods and forest fires. Preserving such an important national and world heritage is crucial, contributing to broadening national and global goals such as climate change mitigation. For this reason, the environment must be treated transversally by both government and society, and not as an independent variable that plays a secondary role in their lives.

Therefore, PMAs need to be seen as key players in this process, not only integrating field actions, but also effectively participating in intelligence data collection and sharing, and tactical and strategic planning. Since the results of their work, although little known, accredit them to this role, but also by the capacity of its members and the size of its staff that, when added, is far superior to any other environmental agency or specialized police organization.

The Union fails when it does not see the PMAs as part of the National Environment System (SISNAMA for its acronym in Portuguese) and does not recognize them as key actors in preventing deforestation in the Amazon. Nor does it devote substantial resources to them from their various programs and funds. States fail when they ignore the role of PMAs in nature protection, and military police corporations when they undervalue the role of PMAs in environmental security and their systemic interconnections with the public order system. Finally, PMAs fail when they do not disclose their role, do not seek sources of funding, do not communicate with the internal public of their corporations and with their counterparts in other states, with society and with the third sector.

Further studies are needed in the other Brazilian biomes in order to analyze how their biotic and abiotic remnants are being protected for a joint reading throughout Brazil, as well as to verify the feasibility of using PMAs in

policing and UC inspection, optimizing the employment of its force, increasing the ostensible state presence, and effectively protecting these areas. These are undoubtedly valuable points for reflection on future explorations.

Notes

¹ Brazilian federative units and its abbreviation: Acre – AC, Alagoas – AL, Amazonas – AM, Amapá – AP, Bahia – BA, Ceará – CE, Distrito Federal – DF, 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.

² Intentional violent deaths (MVI) refer to the sum of the victims of intentional homicide, murder, bodily injury followed by death and deaths resulting from police interventions on and off duty (in some cases).

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