Agricultural frontiers and environmental management

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Jessica Painkow Rosa Cavalcante
She is a Doctor student in Public Law at UNISINOS. Master in Human Rights from the Federal University of Goiás (2018), specialist in Agrarian Law and Agribusiness (2018) and in Civil Law and Civil Procedure (2017), she holds a degree in Law from the Pontifical Catholic University of Goiás (2014). She is a lawyer and has experience in the area of Law, with emphasis on Human Rights, working mainly on the following topics: human rights, traditional communities, democracy and agrarian conflicts. .
ORCID: https://orcid.org/0000-0002-6325-5735
LATTES: 4024280261959707
E-mail: jessi-capainkow@hotmail.com

Maurides Macedo
Postdoctoral Fellow in Human Rights from the University of Texas. Doctor in History from the Pontifical Catholic University of São Paulo (PUC-SP) and Master in History from the Federal University of Goiás (UFG). Specialist in Criminal Procedural Law from UFG. Specialist in Social Policy from PUC-GO. She was a professor at PUC-GO. She is a researcher and professor at the Interdisciplinary Graduate Program in Human Rights at UFG. Lawyer.
ORCID: https://orcid.org/0000-0002-1279-8254
LATTES: https://lattes.cnpq.br/8107202394331830
E-mail: maurinha1312@hotmail.com

Leonardo Matheus Barnabé Batista
PhD student in Environmental Sciences at the Federal University of Tocantins - UFT. He holds a master's degree in Agrarian Law from the Federal University of Goiás (2019), a specialist in Civil Law and Civil Procedure (2017), and a law degree from the Catholic University Center of Tocantins (2015). He is a lawyer and has experience in the area of Law, with an emphasis on Agrarian Law, working mainly on the following topics: quilombola territorial law: culture, traditional peoples and communities; registry law, land overlap, land regularization, possession and property titles. He is linked to the research group Agri-food Law, Territories and Development at the Federal University of Goiás.
ORCID: https://orcid.org/0000-0003-2875-3787
LATTES: http://lattes.cnpq.br/1566159634562298
E-mail: leonardo.matheus.bb@gmail.com

ABSTRACT
This article aims to discuss how the expansion of agricultural frontiers, driven by agribusiness and the absence of information technology interfere in environmental legal management. It asks: how does deforestation carried out within the Legal Amazon contribute to increased environmental damage? And, how do political management and legal management interrelate in the attempt (or not) to avoid an envi-ronmental disaster and to implement the policy of reducing deforestation? The theoretical framework used was the analysis of Martins, Carvalho and Farber, regarding the issues related to environmental political management was based on the criticisms made by Carlos Nobre. And finally, on risk society, the theoreti-cal bases developed by Ulrich Beck are used in this research. The methodology adopted was bibliographic research and documentary analysis

Keywords: Environmental Law, Agricultural Frontier, Environment.

1 INTRODUCTION

The present text deals initially with disaster law and risk society, pointing out the obstacles of the post-industrial society and the importance of the cycle of disasters for the application of the law effectively and preventively.

It aims to discuss how agricultural borders in Brazil interfere in environmental legal management, specifically, showing how the expansion of these borders, driven by agribusiness and the absence of information technology will reflect on the cycle of disasters.

Does it problematize how deforestation carried out within the Legal Amazon contributes to the increase in environmental damage and, how do political management and legal management interrelate in the attempt (or not) to avoid an environmental disaster and to implement the policy of reducing deforestation?

The theoretical framework used was the analysis of Martins, Délton Winter de Carvalho and Daniel A. Farber, regarding the issues related to environmental political management was based on the criticisms made by Carlos Nobre. And finally, on risk society, the theoretical bases developed by Ulrich Beck are used in this research.

Methodologically, a bibliographic research was carried out as well as data analysis. provided by the Deforestation Monitoring Program (PRODES) of the National Institute for Space Research (INPE).

2 THE RISK SOCIETY AND THE LAW OF DISASTERS

When talking about sociology of risks, it is perceived that the transition process in the industrial matrix is a fundamental milestone, considering that the technological and scientific growth that has been occurring reflects directly on the "new post-industrial forms of dangers and risks" Carvalho (2007, p. 102). In this sense, Carvalho (2007, p. 102) understands that:

> Contemporary society is marked by a process of transition from an industrial matrix towards its post-industrial form. This passage demonstrates the confrontation between two evolutionary structures of modern society. This evolutionary history began from the eighteenth century, with the liberal revolutions and, later, with the consolidation of capitalism of industrial production. At that point, the economy passed. To be founded on a massified industrial productive form, settling on the technological creations that resulted in machinery. (CARVALHO, 2007, p. 102).

Despite the evolution in the area of industrial science and in the technological field, the same is not noticed when analyzing the harmful consequences of the use of this technology, and "the scientific uncertainty that falls on the relations of cause and consequence is the mark of new technologies in contemporary society" (CARVALHO, 2017, p. 231)

Along these lines, Beck (2006, p. 5) states that "these 'true' uncertainties, reinforced by rapid technological innovations and accelerated social responses, are creating a new global risk landscape."

As Carvalho (2017, p. 151-152) points out, risks are characterized in the concrete form, which are "characteristic of a social formatting of an industrial nature", and in the invisible (or abstract) form that are "inherent to the risk (or post-industrial) society".

Concrete risks can be calculated and scientifically evaluated in a safe way in their causes and consequences, so they are perceptible and limited to certain social classes, applying to them the principle of prevention, "consisting of a principled orientation more centered on the scientific predictability of the risks arising from a machinist-industrial social format". While abstract risks, when

observed from the perspective of environmental law, can be characterized in invisible forms, because "they escape the perception of the human senses, [...] there is an absence of reliable scientific knowledge about its possible dimensions." (CARVALHO, 2017, p. 151-152).

Risk is a way of relating to the future and will always be the consequence of a decision-making, "consisting of an internal element to the system, while the danger arises from the perspective of the passive agent or the victim (person or system) causing frustrations by external events" (CARVALHO, 2017, p. 153). Carvalho (2017, p. 154) points out that:

> Environmental risks should be seen as a communicative means to construct observations about the future of the environment. [...] the notion of risk, [...] enhances environmental law and its interaction with the economic system (coevolution), through the observation of possible ecological (future) consequences emanating from and arising from legal (and economic) decisions. In the dogmatics of environmental law, the production of concrete and abstract risks by the post-industrial society entails the formation of a legal communication about environmental risks under the normative notion brought by the lato sensu prevention (which encompasses the principles of prevention and precaution). (CARVALHO, 2017, p. 154).

It is important to note the process of evolving awareness of the Law in the face of the new problems that the risk society faces, giving the possibility of presenting new "legal elements that propose deviations from the current structures" and that vary from the constituents of the traditional way. Such legal elements, to be accepted dogmatically, need to have "interaction between risk communication and organizations, in both decision-making processes in environmental matters", at which time there is a selection of these structures, which simultaneously stabilize "from the rationality and logic differentiated functioning of the Law" (CARVALHO, 2017 p.154). These are the evolutionary mechanisms of variation, selection and (re)stabilization (LUHMANN, 2016). Carvalho (2017, p. 155) explains that:

> In summary, the insertion of new elements in Environmental Law, such as the insertion of new instruments and functions, will only be operationalized when these, even deviants, are compatible with the existing legal structure (communication and organizations). This dynamic of reaction to the constant innovations and challenges imposed by the Contemporary Society to the Law is stabilized according to the legal systemic rationality that, in turn, influences and is influenced by communication and by the competent organizations for environmental decisions (decision spaces). This process of Greening Law condenses "new" meanings to traditional legal institutes, as well as the deviant construction of an ecological communication in Law (instrumentalized by new concepts and institutes). (CARVALHO, 2017, p. 155).

It is perceived that there is a certain "variation to the normativist and individualist paradigm of Law" (BECK, 2006, p. 6) that seeks to stabilize itself in the face of the new social form that is a society that produces global risks. In this sense, Carvalho (2017, p. 157) understands that:

> [...] Environmental Law, in addition to using a resizing of classical legal institutes (ownership, attribution of responsibility, administrative licensing, police power, etc.), constitutes the formation of variations to traditional dogmatics, through the institution of new mechanisms (such as the EIA/RIMA, the civil inquiry, transindividual interests, Environmental Democratic

> State, future environmental damage), using them for the protection of the environment. (CARVALHO, 2017, p. 157).

Thus, the interaction between climate change, Environmental Law and Disaster Law is clear, because the consequences arising from climate change in a *society that produces global risks* (BECK, 2010) will be characterized as the point of intense intersection that needs, be made the adaptation of the management of catastrophic risks, on a scale of socio-environmental damage. Carvalho (2013, p. 398) understands that:

> This is especially significant when it is reflected in this climatic phenomenon as a cumulative event constituted historically, slowly and gradually (*slow motion disaster*). Still, *the deficits* in environmental regulation potentiate the occurrence of disasters, such as irregular occupation of the soil, large-scale contamination, disrespect for the protection of permanent preservation areas, absence of legal reserves, occupation of areas on hillsides and areas prone to flooding. Thus, the future of environmental law in a context of climate change is closely linked to disaster law. In other paints, what in the industrial age consisted of an environmental damage, in a post-industrial moment, with all the cumulative factors and increments in the technological potential of humanity, will often consist of an environmental disaster. (CARVALHO, 2013, p. 398).

As Carvalho (2013, p. 406) and Farber (2010) indicate, the point of intersection between environmental law and disaster law is made when the consequence of a disaster (of natural, human or mixed cause) reaches and compromises in the environmental sphere.

Article 2, item II, of Decree No. 7,257/10, [1]provides the normative definition of what would be disasters, being, "the result of adverse events, natural or man-made on a vulnerable ecosystem, causing human, material or environmental damage and consequent economic and social damages." That is, it needs to be a catastrophic event that affects communities, going beyond the private sphere (with a social/collective character).

Given all this characteristic of prevention and precaution supported by environmental law, several provisions are inserted in the Brazilian legislation with the intention of anticipating "environmental damage through a system of environmental risk management by Environmental Law." (CARVALHO, 2013, p. 407).

Also, in article 225 of the Federal Constitution an example of a preventive and precautionary posture of the law is adopted, being "this attribution of a legal protection of future generations, in order to avoid the future realization of environmental damages, is guided by the structural trilogy of Contemporary Environmental Law", being "the interaction between the principles of interoperable equity, of prevention and precaution." (CARVALHO, 2017, p.158).

The role of law in matters of disasters and risks is made in the "function of *providing stability through normativity,* both to avoid and to respond to the chaos brought by the disaster", in this way, it

[1] As Carvalho (2013, p. 407) points out: "The core of the normative system of Disaster Law in Brazil is formed by Federal Decree n. 7,257/2010, Federal Law n. 12,340/2010 and Federal Law n. 12,608/2012".

seeks to regulate the "actions of anticipation and response", with "emphasis [...] eminently preventive" (CARVALHO, 2013, p. 397). As Carvalho (2013, p. 407) points out, the law seeks to give a normative stability in disaster management:

> Therefore, the legal system must be committed to the formation and imposition of the construction of ex *ante and* ex post *information systems, as well as to the* clear delimitation of the obligation to provide this, right of access, effective publicization and prediction of the competent authorities that are in their possession, as well as updating of these data. [...] Law, whether as a core practice (jurisprudential judicial) or peripheral (legislation), must standardize a process of *dynamic stabilization* of disasters. In this sense, best practices *consist of local* applications of ways of coping with disasters, emphasizing cultural knowledge, geography, environment and local science. On the other hand, *best practices* always include a critical reflection of the feasibility and efficiency of local implementation of disaster prevention and response strategies, based on the cultural, axiological, scientific, legal and environmental characteristics and peculiarities of a *given* locality. (CARVALHO, 2013, p. 407).

Thus, the structure of disaster law is determined in a cyclical way, which Sarat (2009) divides into five dimensions (event - response - compensation - reconstruction - risk mitigation). Carvalho (2013, p. 400) explains in detail that:

> For Austin Sarat, there are 5 (five) dimensions in which the Law is called to deal in cases of disasters: the Law must (i) *maintain its operability*, being able to ensure the ability to operate according to its standards rules, procedures, routines and protocols; (ii) *fight against the absence of rights*, in cases of disasters there is a need to ensure rapid action on crimes and disorder in communities affected by such events; (iii) provide *stabilization and reaccommodation*, and victims should be sheltered and, depending on the severity of the event, should be permanently relocated; (iv) promote *the identification of victims and those responsible, and the Law is expected* to perform *its traditional function adequately, with the attribution of responsibilities, unleashing the human and non-human factors that contributed to the occurrence of* the catastrophic event (those who deserve care and those who deserve punishment); (v) *reduce future vulnerability*, through learning processes resulting from the bitter lessons left by the catastrophes already experienced, framing the successful experiences. (CARVALHO, 2013, p. 400).

In order to prevent and plan responses to catastrophic events, Disaster Law seeks to remain operational and cyclical. However, two factors end up hindering its circularity: information and culture.

As an example of lack of information, there are anthropogenic disasters, the cause is more linked to social vulnerability, which has as a species the technological vulnerability that will relate to the failures and gaps in the flows of information or knowledge, that is, with factors that refer to the cause and aggravation. On the other hand, culture is more related to absence, lack of attention and awareness of the need for risk management.

As disasters occur with vulnerabilities, the law is considered an important element in leading the fight against social and environmental injustice. Carvalho (2017, p. 155) emphasizes that here in Brazil there is a low culture of disaster risk management, and this contributes to increase the likelihood of more/new/other disasters occurring.

As an example, in Brazil, environmental disasters can be characterized by droughts[2], landslides and floods, [3]oil spills, [4]air pollution[5], the rupture of dams[6], and also with the phenomena of agricultural frontiers that generate deforestation, and is intensified with the structure formed around agribusiness and the rampant use of pesticides.

However, the intersection between disaster law and environmental law is made in the damage caused, on a socio-environmental scale, which, in contemporary society, is strongly threatened by the risks arising from the various sectors of production, which often do not pay attention to the circularity of risks when adopting a preventive posture.

3 AGRICULTURAL FRONTIERS IN BRAZIL

After all, how could the phenomenon of the agricultural frontier become a risk on a scale of environmental disaster in Brazil? First we need to explain the border phenomenon. The concept of border, under the traditional nature, is related to the occurrence of a specific anthropic phenomenon linked to the use of land. This phenomenon is divided most of the time into two moments, this is because, there is a certain concern "to show the articulations between the capitalist sectors of Brazilian society" (MIZIARA, 2000).

In this sense, Martins (1996, p. 29), calls the first moment of "Expansion Front", [7]which is characterized by demographic emptiness, by the specificity of social organization, thus being a non-capitalist occupation. Waibel (1995, p. 4) understands that "the border, in the economic sense, is a zone, more or less wide, that is interspersed between the virgin forest and the civilized region. We call this area a pioneer zone." Here, we have as an example, the conception of occupation of space by indigenous populations (original peoples).

The second moment is that marked by capitalist relations in the mode of production and that "extend their domains to areas previously dominated by non-capitalist relations", which Martins (1975, p. 45) calls the "Pioneer Front", having as reference, the conception of occupation of space by entrepreneurs, farmers, merchants, small modern farmer and the entrepreneur Martins (1996). Martins (1975, p. 45) explains that:

[2] Large periods of droughts that occur mainly in the northeast, which are due to climate change.
[3] Facts of higher incidence in the State of Rio de Janeiro.
[4] As the example of the Campos Basin - 2011, Guanabara Bay - 2000, Iguaçu River Basin - 2000, São José dos Campos - 1998, Castelo Branco Highway - 2001 and etc.
[5] Like what happened in the "Valley of Death" in Cubatão in the 50's.
[6] That happen with greater incidence in the State of Minas Gerais, for example: Fundão Dam in Mariana/Mg and Córrego do Feijão Mine Dam in Brumadinho/MG.
[7] For Martins (1996, p. 29): "the notion of expansion front, in this context, is essentially based on implied. These implications have emerged in the last two decades, in the works of authors who have done research in the Amazon region. For some, the expansion front appears to be the expansion of the frontier of civilization. Obviously, there is no immediate relationship between these different definitions. On the other hand, the conception of the pioneer front gradually disappears, diluted in that of the expansion front, as the expansion front comes to be understood, predominantly, as an economic front."

> The pioneering front expresses a social movement whose immediate result is the incorporation of new regions by the market economy. It presents itself as an economic frontier. Understanding it as such, however, implies considering that, in the Brazilian case, the economic frontier does not necessarily coincide with the demographic frontier (as a rule, the latter falls short of this). The range between one and the other, although being populated (although with low indices of demographic density), does not constitute a pioneering front and does not constitute basically because its economic life is not structured primarily from relations with the market. (MARTINS, 1975, p. 45).

Thus, Martins (1996, p. 27) explains that the intention in the conceptions of expansion front and pioneer front is far from being one that supposes "a specific and substantive reality", and, therefore, "they are not exactly concepts, but only designations through which researchers actually recognize that they are in the face of the different ways in which the civilized expand territorially", for, the frontiers more refer to the "ways of being and of living in the new space". For Martins (1996, p. 28):

> Geographers, since the 40s, have imported the designation of pioneer zone to name it, other times referring to it as pioneer front. Anthropologists, for their part, especially from the fifties, defined these fronts of displacement of the civilized population and economic activities somehow regulated by the market, as fronts of expansion. As Darcy Ribeiro, the author of the most important study on these fronts, suggests, they constitute the boundaries of civilization. [...]. What we have, in both definitions, is, first of all, ways of seeing the border, different from each other because in both cases the social places from which reality is observed are different [...]. I understand that these distinct and, in a way, mismatched perspectives lead to seeing different things because they are different expressions of the same thing. The conception of the pioneer front implicitly understands the idea that at the frontier the new, new sociability is created, founded on the market and on the contractuality of social relations. Basically, therefore, the pioneer front is more than the displacement of the population over new territories, more than those who employed these conceptions in Brazil supposed. The pioneering front is also the spatial and social situation that invites or induces modernization, the formulation of new conceptions of life, social change. It constitutes the opposite environment to that of the ancient regions, emptied of population, routine, traditionalist and dead. However, the ideas underlying the two conceptions, of the expansion front and the pioneer front, suggest that, despite appearances to the contrary, they refer to substantive social realities, singular modes of organization of social life, of defining values and social organizations. Substantive realities that have not been defined by those who employed them. Anthropologists, when they speak of the expansion front, do so basically to spare words in the definition of what the Indian faces. They're not saying anything specific and defined. They are saying that over the tribal territories moves the population and cultural frontier of the whites. (MARTINS, 1996, p. 28).

Still, a third specific phenomenon is revealed when capital advances on itself, revealing the presence of a peculiar frontier dynamic, this phenomenon is called by Miziara (2000) "Agricultural Frontier", which "is an illustration of the application of methodological individualism", because, "macro factors", such as state intervention, development of the productive forces, change in the technological base, etc., create conditions for the action of the individual capitalist." In the words of Miziara (2000, p. 3):

> [...] These macro factors alone do not guarantee the occurrence of new applications of capital, being necessary to understand the process, to perceive the elements that make the individual capitalists make the decision, or not, to apply their resources in other places. [...] We consider that this perspective - articulation between MARO and micro analysis factors - presents an

> advance in the ability to explain the models usually employed by the social sciences. (MIZIARA, 2000, p. 3).

For Souza et al (2013, p. 916), the agricultural frontier goes beyond the simple conception of land occupation, it represents the expansion of modern agriculture, with the increase in the intensive use of technology in production, let's see:

> Territorial occupation in the Amazon starts with settlers, or colonists, who clear the area to determine ownership using a limited number of production techniques (Young and Fausto, 1997; Fearnside, 2008). Then, the land grabbers come and cast the pioneers out or invade public land, thus preparing the area for speculation and the entry of farmers or ranchers (London and Kelly, 2007; Fearnside, 2008). The presence of land grabbers facilitates the entry of more technological production methods and transforms the space into an agricultural frontier (Fearnside, 2008; Margulis, 2003). The concept of agricultural frontiers not only deals with the occupation of territorial spaces but also includes the expansion of modern agriculture (Miziara, 2000), with increases in the intensive use of technology in production (Morton et al., 2006; Foley et al., 2005). Thus, the measurement of technology in agricultural production determines the space in which the market economy is consolidated. (SOUZA et al, 2013, p. 916).

Thus, presenting one of the highest levels of biodiversity in the world in its demographic space, the Amazon Forest, specifically, the Legal Amazon, [8]constitutes a region that "consolidates its participation in the general process of territorial transformation of Brazil", specifically, regarding "the changes that have occurred in the use of land, in which the expansion/intensification of agriculture ends up determining [...] the economic and demographic dynamics of this immense region." (IBGE, 2019).

The expansion of the agricultural frontier[9] in the Amazon is intense and potentially focused on the cultivation of grains on a large scale[10], these areas were "traditionally occupied by extensive cattle ranching", or "covered by an original vegetation of cerrado", or (to a lesser extent) "forest".

> In fact, the entry of capitalized agriculture in the Amazon constitutes a historical novelty in the use of land in a region whose economy revolved around mineral extraction and plant extractivism, especially rubber, whose survival, today, depends largely on the commitment of local populations to preserve their collective forms of appropriation and use of natural resources, Counting on strong international support. Thus, evidence is accumulating that signals important changes in the structure and performance of the agricultural sector in this region, many of which are associated with the introduction of new technologies, methods and

[8] Article 1 of Law No. 11,952/09 refers to the concept of Legal Amazon as defined in Article 2 of Complementary Law No. 124/07. The term "Legal Amazon" is the one used by the Brazilian government to a certain area of the Amazon Forest, and Complementary Law No. 124/07 establishes in the form of article 43 of CF/88 the Superintendence of the Development of the Amazon (SUDAM), delimiting as the area of its operation the comprehensive territories of the "States of Acre, Amapá, Amazonas, Mato Grosso, Rondônia, Roraima, Tocantins, Pará and Maranhão in their portion west of the 44th Meridian". In the wording of the old Forest Code (Law No. 4,771/65), the States of Goiás and Maranhão were included, however, this legislation was repealed.

[9] The most recent agricultural frontier located in the Legal Amazon is called MATOPIBA. The expression MATOPIBA results from the initials of the states of Maranhão, Tocantins, Piauí and Bahia (considering that this project of expansion of an agricultural frontier partially covers these states).

[10] "Mainly, in the cerrado areas of the Legal Amazon, including Mato Grosso, Tocantins and southern Maranhão, where a climate with a defined dry period dominates and the flat topography admits mechanization at the same time that the soils present characteristics that respond to the modern technology employed." (IBGE, 2019)

> crops in the field, whose effects affect the natural environment - via deforestation, erosion and water pollution, among others - as well as fall on the generation of income, employment and general living conditions of its population (IBGE, 2019).

However, it is evident that the agricultural frontier phenomenon drives eminent risks, such as: deforestation and mass, social impacts, [11]displacement of populations,[12] exacerbated use of pesticides (due to monoculture).

> In relation to the social impacts, it is observed the displacement of populations from rural areas of the regions of expansion of the agricultural frontier to the large cities due to the introduction of soybean monoculture through mechanization, use of fertilizers and genetically improved seeds, as well as expansion of large land holdings. Large companies occupy spaces in the countryside previously occupied by diversified family cultures, reducing employment in the countryside and the capacity to produce traditional foods, compromising the food security of the population. [...] The vegetation domain that is established in the region of agricultural advancement is the Amazon Forest, which represents one of the most important ecosystems in the world, due to the collaboration in climate regulation, through evapotranspiration and carbon sequestration, and in the conservation of biodiversity, among other benefits. However, this did not prevent the opening of new areas for soy monoculture, at the expense of deforestation of forests, which can intensify processes of erosion, soil loss and leaching. (DOMINGUES, 2012, p.09).

3.1 THE RISK SOCIETY AND THE IMPACTS ON POLICY TO COMBAT DEFORESTATION

Studies by Souza et al (2013) are focused on the spatial variation of deforestation rates in the Brazilian Amazon (2005-2009), pointing out as one of the most relevant results the discovery of the relationship between the current agrarian structure and the level of deforestation:

> the current agrarian structure and its relationship with deforestation determine the axes of Amazon deforestation. Among the factors affecting deforestation, the appropriation of land, namely the entry of capitalism and mode of production, as indicated by the transformation of land into a commodity, continues to have a significant relationship on deforestation. (SOUZA et al, 2013, p. 920).

In the 1970s it was found that deforestation rates were correlated with the inflow of state capital, whereas from 1990 to 2000, deforestation was related to the entry of representatives of the international *commodity* market in the Amazon, and, studies point out, that the relationship with the drop in deforestation data is attributed to the increase in protected areas, awareness of controls, government control and *commodity reduction*:

[11] "What is sociologically most relevant to characterize and define the border in Brazil is, precisely, the situation of social conflict. And this is certainly the most neglected aspect among researchers who have tried to conceptualize it. In my interpretation, in this conflict, the border is essentially the place of otherness. That's what makes it a unique reality. [...] the conflict makes the border essentially, at the same time, a place of discovery of the other and of disagreement." (MARTINS, 1996, p. 27).

[12] On the subject, Martins (1996, p. 26-27) comments: "Not only the Indians of the frontiers were involved in the violent struggle for land. Also, the peasants of the region, former or recently migrated residents, were affected by the violence of the big landowners, by the murders, by the expulsions, by the destruction of houses and villages. Between 1964 and 1985, almost six hundred peasants were murdered with conflicts in the Amazon region, by order of landowners who disputed with them the right to land."

> In the 1970s the increase in deforestation rates showed a correlation with the entry of State capital through incentives (i.e., loans, tax breaks) (Margulis, 2003). Margulis (2003) states that the clearing of forests from 1990 to 2000 was mainly due to the entry of representatives from the international commodities market in the Amazon. The drop in deforestation rates in recent years is attributed to an increase in the number of protected areas, decrease in commodity prices in the international market, consumer awareness and government control (Nepstad et al., 2009). However, this struggle for control is, in most cases, only palliative, because the damage caused to the forest has already been performed. (SOUZA et al, 2013, p. 920).

Brazil, possessing almost 30% of the world's primary land, leads the ranks in deforestation with more than nineteen thousand kilometers of forest cut per year, according to research conducted between 1996 and 2005 (SOUZA et al, 2013, p. 916). Although the data provided by INPE point to a drop in the rate of deforestation in the years 2012 and 2014, it is perceived that in 2018 the rate of deforestation remains equivalent to the year 2009,[13] thus there is no significant improvement. It is important to mention that Souza et al (2013), attributes two factors to the increase in deforestation levels, the first to agrarian technology and the second to the absence of an effective prevention policy (both factors present in the circularity of risks).

> The issue of vulnerability and adaptation must be addressed pragmatically, including the development of models that take into account the needs of developing countries. In this effort, the participation of technicians and scientists is crucial, as well as the strengthening of institutions in developing countries. The Brazilian experience in this domain shows the need to adjust the methods applicable to climate change scenarios resulting from global models for projections of regional or local scope. This adjustment would be useful for studies on the impacts of climate change in areas such as water resource management, ecosystems, agricultural activities, and even the spread of disease. The higher resolution obtained in regional or local models would contribute to a realistic prediction of extreme changes and to a substantial improvement in the assessment of countries' vulnerability to climate change and their capacity to adapt. (MARENGO, 2006, p. 142).

Still, they rate as a relevant discovery the coincidence between the low level of agrarian technology (both in agriculture and livestock) and deforestation in the Legal Amazon. What's more, the low cost of labor and subsocial use indicate a precarious and unsustainable exploitation of natural resources.

Another aspect to be considered is governance policies: [14]inspection acts and the establishment of new Conservation Units[15] can reduce the level of deforestation in certain regions, although recovery is not evidenced, but rather a drop in the level of deforestation:

[13] As noted in the Table extracted from TerraBrasillis and attached to the end of this article.
[14] Another threat factor is the collective health, because it is known that with agribusiness and monoculture the pesticide policy is being encouraged by the federal government.
[15] The complexity of the debate on the institution of protected areas seems to reach since the 1990s a discursive level that privileges social and economic aspects. This premise can be seen in the reports of the conferences organized by the United Nations (LAGO, 2007) and in the fierce controversy between conservationists-preservationists and socio-environmentalists. Although, if the modalities of Conservation Units and their specific rules are analyzed, a utilitarian bias seems to prevail. Still, it is important to develop, later, on the issue of the relimitation of Conservation Units by provisional measure, which is usually carried out in favor of eminently capitalist interests (apparently a "pioneer front") and connotes a specific dialectic between the second moment of expansion of the border and the environmental protectionism emulated by the creation of Conservation Units. It reveals, then, a new debate that can unfold in specific studies.

> In this context, prevention is as important as punishment for illegal environmental actions. Prevention requires the identification of factors that promote or inhibit deforestation. Surveying locations where a combination of these factors appear may help to detect deforestation (Ferreira et al., 2007). Given the myriad of factors that determine deforestation in tropical forests, the control of tropical forest loss may be one of the largest environmental challenges of all time. This challenge has consequences in the short, medium and long term, not only in the environmental field but also in the socio-economic and political realms. The importance of this challenge can initially be measured by the contribution of tropical forests to global biodiversity (Peres et al., 2010) and by the importance of the Amazon to the hydrological regime of South America (Fearnside, 2005). Tropical forests store 200 billion tons of carbon dioxide (IPCC, 2000), making tropical forest preservation essential to controlling global warming (IPCC, 2007; Stern, 2006). Additionally, clearing of tropical forests contributed between 10 and 35% of the global emission of carbon dioxide to the atmosphere in the 1990s (IPCC, 2007; Houghton, 2005; Achard et al., 2002; DeFries et al., 2002). (SOUZA et al, 2013, p. 920)

However, analyzing the relationship between deforestation and the area occupied by small and large producers, Souza et al (2013, p. 920) points out, in a way, a significant positive relationship between deforestation and land concentration:

> The positive relationship between land concentration and deforestation has been observed in recent years, confirming a general opinion that environmental problems in the Brazilian Amazon, such as deforestation, are closely related with land concentration (Walker and Homma, 1996). Moreover, both environmental problems and land concentration create conflicts with indigenous peoples, traditional communities and small farmers, who end up being victims of land concentration. Thus, 60% of rural assassinations in Brazil between 1997 and 2006 occurred in the Amazon region, and there is a clear relationship between these assassinations and deforestation (CPT, 2007). Almost 45% of rural assassinates that occurred in the Amazon region between 2003 and 2004, occurred in the 10 municipalities with highest deforestation rates, in 2004 (Celentano and Veríssimo, 2007). The assassinations highlighted in the media over the last few years include Dorothy Stang in 2005 and the environmentalist couple José Claudio Ribeiro and Maria do Espirito Santo 2011, both of which in Pará. A significant positive relationship between deforestation between 2005 and 2009 and land concentration may be explained by Browder et al. (2004) who found that small farmers, who depend solely on farm income, increase the labor on their properties in a mosaic of perennial crops, temporal and fallow areas, with a decrease of forest conversion to pasture. Nevertheless, a case study of Uruará (Aldrich et al., 2006), Pará State, disagreed with the concept of less responsibility for the conversion of forest into productive areas being placed on small producers. In this case study, the authors found that the large farmers increased the area of deforestation an average of 5 square kilometers in 13 years, while the small farmers increased the area of deforestation an average of 600 square kilometers in the same time period. Other studies (e.g., Pacheco, 2009) also found that the relationship between small producers and the forest is not always friendly or less aggressive and, in some cases, may produce the complete conversion of forest into pasture. A similar conclusion was reached by Michalski et al. (2010), who found that the main driver of deforestation in the Alta Floresta region, Mato Grosso state, was property size, with smaller and older properties presenting less preserved forest than larger and younger properties. This finding explains the increased number of small areas (from 18% in 2002 to 38% in 2007) and participation of land reform colonists in the rates of deforestation in recent years, as measured by PRODES (INPE, 2008). Thus, small property holders may soon have a greater responsibility for the annual deforestation in the Amazon than large landowners (Oliveira-Filho and Metzger, 2006). (SOUZA et al, 2013, p. 920).

Finally, the essay points out a specific dialectic between (a) protectionist environmental actions, (b) international discursivity and (c) the specific dynamics of the border, taking into account the

Brazilian agrarian structure and the spatialization of deforestation in the Amazon. This hypothesis should be specifically developed in later works.

Thus, there seems to be a relationship between the concern with the Amazon, although apparently linked to a utilitarian bias of rationalization of the use of natural resources, and the open and discursive concept of sustainable development introduced by Brundtland's report. It is noticed that, after the transition between the environmental meetings organized by the United Nations, mainly, between ECO 92 (United Nations Conference on Environment and Development, 1992) and the Johannesburg Summit (World Summit on Sustainable Development, 2002), it is clear the difficulty in implementing the goals and recommendations set in Rio de Janeiro (1992) (LAGO, 2007).

However, analyzing the phases of the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm) it is noticed that in the implementation of the first[16] phase it obtained a satisfactory result since it reduced 11.9K Km2; in the second phase, [17]a continuous improvement in deforestation rates, reducing 1.1K Km2 of deforested area; in the third phase there was an increase of 1.6K Km2 of deforested area;[18] and, in the fourth phase the [19] worsening continues, since from 2005 to 2006 there was an increase of 1.7K Km2 and until the present moment the deforestation data remain higher than those for 2005, realizing the difficulty of meeting the targets set.

It is noticeable the increase pointed out by the satellite monitoring system Deter[20], of the National Institute for Space Research (Inpe), which, as Nobre[21] points out:

> The figures from Prodes' annual series, which covers the period from August 2018 to July 2019, should confirm what the data from recent months have shown: that deforestation of the Amazon in the last 12 months was much higher than in the previous period. We have to assume that there is indeed an increase in deforestation in the Amazon. The system pointed out that deforestation in the Amazon in square kilometers (km²) increased in the months of May, June and the first 20 days of July, respectively, 34%, 91% and 125% compared to the same months in 2018. These percentages of increase are far beyond the margin of uncertainty. The probability that Amazon deforestation is increasing is above 99%.

[16] From 2004 to 2008. That had as objective: "To promote the reduction of deforestation rates in the Brazilian Amazon, through a set of integrated actions of territorial and land planning, monitoring and control, promotion of sustainable productive activities and infrastructure, involving partnerships between federal agencies, state governments, municipalities, civil society entities and the private sector." (PPCDAm, 2004).
[17] From 2009 to 2011.
[18] From 2012 to 2015.
[19] From 2016 to 2020.
[20] "These public data allowed a huge understanding of the causes of deforestation and provided the support policies that have had great success for several years. The eventual embargo of the deforestation figures obtained by Deter and Prodes or the discontinuation of these two systems would cause enormous losses to the country and would make Inpe lose its global role in the development of forest monitoring systems. Not disclosing INPE's deforestation data would not make the problem go away, because today there are many groups around the world that do this type of mapping. But INPE, which has developed the world's best rainforest monitoring system over the past 30 years, would lose its leadership. This represents a huge improvement of this monitoring system, which is the result of 30 years of scientific advancement. Deter's data are not for measuring deforestation, but for deforestation alert, to assist Ibama in enforcement actions. It would be wrong to use them to indicate deforestation. The Prodes data are intended to measure deforestation, but they take a certain amount of time to compile." (NOBLE, 2019).
[21] The statement was made by Carlos Nobre, during a lecture at the 71st Annual Meeting of the Brazilian Society for the Progress of Science (SBPC), held from July 21 to 27 at the Federal University of Mato Grosso do Sul (UFMS), in Campo Grande. Access in:<encurtador.com.br/CDP15>.

Following this line, Marengo (2006, p. 138) analyzes the possible impacts of climate[22] in Brazil:

> Based on the observational evidence and trends already observed in Brazil, as well as from studies done, considering the climate projections of the future derived from the IPCC climate models, and together with the overview of impacts of climate change in Brazil presented by Greenpeace, in the Report "Climate Change, Life Changes" (Greenpeace 2006), and other recent studies, the climate impacts in Brazil would be as follows: Amazon – If the advance of the agricultural frontier and the timber industry is maintained at current levels, forest cover could decrease from the current 5.3 million km2 (85% of the original area) to 3.2 million km2 in 2050 (53% of the original cover). Global warming will increase temperatures in the Amazon region, and may make the climate drier, causing the savannization of the forest. The observed warming can reach up to 8oC in the pessimistic scenario A2. River levels can drop significantly, and the dryness of the air can increase the risk of wildfires. [...] Agriculture – Perennial crops, such as oranges, tend to seek regions with milder maximum temperatures and production may move south. High summer temperatures will condition the displacement of crops such as rice, beans, soybeans to the Midwest, promoting the change of the current production axis. [...] The IPCC (2001 a-c) estimates that by the year 2100, the global average temperature will increase between 1.6oC and 5.8oC, representing warming rates of 0.1oC to 0.4oC per decade. These values are comparable to the rate of 0.15oC per decade observed since the 1970s. Warming varies between seasons, with values between 0.1oC and 0.4oC per decade for the months of December to February, and 0.2oC to 0.6oC per decade for the season between June and August. For Brazil, the highest values of the warming rate will be observed in the Amazon rainforest and the lowest in the southeastern states, along the coast of the Atlantic Forest. (MARENGO, 2006, p. 138).

However, political concerns aimed at nature protection have managed to progress side by side with development policies, even though, the internationalization of the debate in recent decades has driven the adherence to more effective and punctual governance actions. It is also possible to perceive that the norms that deal with goals to combat deforestation, environmental infractions and others of a preventive nature are of little use if there is no culture of information about the theme solidified in society.

4 CONCLUSION

In this context, it is perceived that prevention is as important as the punishment of illegal environmental actions, and the control of deforestation is one of the greatest environmental challenges of a political and legal nature of the times in which the risk society is configured. There seems to be a specific dynamic between some moments of the border and the implementation and institution of protectionist policies, as occurs with the delimitation and relimitation of Conservation Units.

[22] "A second distributive economic consequence is that the Midwest and North regions, in which agribusiness stands out and expands the agricultural frontier, are the most severely affected by global warming. If the Brazilian agribusiness sector has currently been important to balance the country's balance of payments, given the future prospects of the effects of global warming, Brazil should rethink the direction of the flow of investments in its productive matrix. In the case of the agricultural sector, even with the recent volume of significant investments made by the Brazilian Agricultural Research Corporation (Embrapa), among others, still, past technological advances do not seem to be able to compensate for the losses caused by global warming. It may be necessary to retool the domestic industry to face competition in the foreign market, as a new source of foreign exchange." FERES, Joseph; KINGS, Eustathius; SPERANZA, Juliana Simões. IMPACT OF CLIMATE CHANGE ON SeTOr AgríCOLA brASILeIrO. In: BRAZIL, Climate Change in et al (Ed.). IMPACT OF CLIMATE CHANGE ON SeTOr AgríCOLA brASILeIrO. Brasilia: Ipea, 2011. p. 301-314.

It is perceived (in a macro context) that political and legal management of environmental governance go hand in hand since they are related in the common objective of preventing and combating deforestation, however, they are dependent because, varying the political context of the federal government (the focus of economic interests), the scenario of deforestation changes for worse or better. This hinders the implementation of punishment and prevention provided for in laws, since these only produce greater effects in the medium to long term, because, in the environmental issue, the law comes with the role of raising awareness of society through prevention and punishment policies, a role that is constantly threatened by alien legislations of[23] a strictly political nature[24].

Thus, the absence of information culture, agrarian technology and commitment to the principle of prevention and precaution are consequences arising from the phenomenon of agricultural frontier that compromises the circularity of risk and, consequently, prevents the full functioning of environmental legal management.

With the operation in the initial phase (prevention and precaution) compromised, it is clear the clear risk and the need to work, within the legal management, in the policies aimed at the phase of response to exacerbated deforestation (regarding the climatic implications) and in the common use of pesticides at high levels of contamination (regarding the health of the population), which, unfortunately, is also linked to the environmental policy management of the federal government. Thus, in environmental management policy the interest should not only be legal, but mainly political and social.

[23] As an example, see the article on MP 867/2018, which provides for the extension of the deadline for joining the Environmental Regularization Program.
[24] As an example see article on reissue of MP 867/2018.

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