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HOW TO SAVE THE AMAZON: WHY THE FOREST HAS MORE VALUE STANDING THAN CUT DOWN[1]

COMO SALVAR A AMAZÔNIA: POR QUE A FLORESTA DE PÉ VALE MAIS DO QUE DERRUBADA

Luís Roberto Barroso[2]

Patrícia Perrone Campos Mello[3]

Abstract

This paper discusses the importance of the Amazon to the global ecosystem, the reduction and the advance of deforestation of the forest in Brazilian territory, as well as the escalation of environmental crimes, with emphasis on illegal logging, land grabbing and unauthorized mining, including in indigenous lands. The text points to public policies that have been successful in containing the destruction of the forest and the setback they have suffered in recent times. In the final part, the article describes the forest exploitation models adopted so far, with their limited economic social results, and presents an alternative model, which combines the Fourth Industrial Revolution and forest bioeconomy. Finally, the paper also presents contributions that international agents can offer to the preservation of the forest, through financing (REDD+ mechanisms), as well as conditionalities formulated by consumer and financing markets.

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[2]] Master from Yale University, Doctor and Professor from the State University of Rio de Janeiro - UERJ. Visiting Scholar at Harvard Law School and Senior Fellowna Harvard Kennedy School. Professor at UERJ. Minister of the Supreme Federal Court. State University of Rio de Janeiro - UERJ - Brazil. Lattes: http://lattes.cnpq.br/2430424576721113ORCID: 0000-0003-3407-2304 E-mail: gabmlrb@stf.jus.br

[3] Master and Doctor in Law from the State University of Rio de Janeiro - UERJ. Visiting Researcherno Max Planck Institute for Comparative Public Law and International Law. Professor at University Center of Brasilia - UniCeub. Advisor to the Minister of the Supreme Federal Court. State Attorney of Rio de Janeiro. University Center of Brasilia - UniCeub - Brazil. Lattes: http://lattes.cnpq.br/5868299371482978 ORCID: 0000-0003-2929-5642 E-mail: pcamposmello@uol.com.br

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Keywords: Amazon, deforestation, environmental crime, economic exploitation models, fourth industrial revolution, financing (REDD+).

Resumo

O presente artigo expõe a importância da Amazônia no ecossistema global, o recuo e o avanço do desmatamento da floresta situada em território brasileiro, assim como a dinâmica da escalada dos crimes ambientais, com destaque para a extração ilegal de madeira, a grilagem de terras e o garimpo não autorizado, inclusive em reservas indígenas. O texto aponta as políticas públicas governamentais que tiveram sucesso em conter a destruição da floresta e o retrocesso que sofreram nos últimos tempos. Na parte final, são descritos os modelos de exploração da floresta adotados até aqui, com limitados resultados econômicos e sociais, e apresenta-se o modelo alternativo que vem sendo proposto, combinando a Quarta Revolução Industrial com a bioeconomia da floresta. Apresentam-se, ainda, as contribuições que os atores internacionais podem oferecer à preservação da floresta, através de financiamento (REDD+), bem como da formulação de exigências dos mercados consumidores e financiadores das atividades desenvolvidas na Amazônia Legal.

Palavras-chave: Amazônia, desmatamento, crime ambiental, modelos de exploração econômica, quarta revolução industrial, financiamento (REDD+).

Introduction

AMAZONIA: HUMAN SECURITY, SUSTAINABLE DEVELOPMENT

AND CRIME PREVENTION

I. PRESENTATION OF THE THEME

The following article was written to serve as the basis for the conference to be given by the first author at the XIV United Nations Congress on Crime Prevention and Criminal Justice, originally scheduled for April 2020, in Kyoto, Japan. The COVID pandemic -19, however, imposed the postponement of the event. The central concern of the work is to identify the causes of deforestation in the Brazilian Amazon, as well as to overcome the indifference and ignorance that still prevail in important circles about the seriousness of the problem. Throughout the text, after a brief geopolitical presentation of the Amazon region, an attempt

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is made to demonstrate the real risk of the forest's perishing, the perverse mechanisms that have led to its destruction and the paths for its preservation.

The Amazon or Amazon Basin occupies an area of around 7 million km2, corresponding to about 40% of South America (BARBOSA, 2015, p. 1) and 67% of the world's tropical forests (IMAZON, 2013). Approximately 5,500,000 km2 are dense rainforest. The region comprises the territory of 9 countries[4], but 60% of its extension is located in Brazil. About 27 million Brazilians live in the so-called Legal Amazon (SUDAM, 2016, p. 11)[5]. As it will deepen throughout this study, the Amazon is the largest biodiversity reserve in the world, having a decisive influence on the climate stability of Brazil and the planet, among other reasons, for its carbon retention, for its role in the rain regime and as freshwater course that flows into the Atlantic Ocean. The region is also home to a variety of peoples and cultures, including dozens of indigenous tribes, some without contact with civilization[6]. Since the 70s of the last century, a critical duality has been formed about the treatment to be given to the forest: on the one hand, developmentalists and, on the other, environmentalists. The present work will explore this tension, in search of the possible balance between the two strands. It goes without saying, however, that deforestation is seen by the authors as a serious, undesirable fact that negatively affects the region, the country and the planet.

The analysis carried out in this text is guided by three essential concepts in the matter: *human security*, sustainable development and prevention of environmental crimes. The expression human security constitutes a broadening and deepening of ideas such as human dignity, fundamental rights and an existential minimum (*basic needs*), based, especially, after

[4] Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname and Venezuela.
[5] The Brazilian government created the concept of the Legal Amazon, which includes, in addition to the states of the North region (Acre, Amapá, Amazonas, Pará, Rondônia and Roraima), also Mato Grosso, Tocantins (Midwest region) and the West of Maranhão (Northeast region). V. Law no. 5,173, of October 27 1966 and Complementary Law no. 124, of 3 jan. 2007. It is interesting to note that the Legal Amazon covers not only the tropical forest biome, but also the cerrado and the wetland.
[6] There are 170 indigenous peoples and it is estimated that 46 of them are isolated or have little contact. V. Abramovay, 2019, p. 55.

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the Second World War[7]. In a tight synthesis, it is possible to say that it materializes in three essential and complementary freedoms: that of not being afraid, that of not experiencing material deprivation and that of living with dignity (UN, 2005). The meaning of sustainable development has been outlined in the past 50 years in different international meetings and documents[8]. Since the classic formulation of the Brundtland Report of 1987, sustainable development has been defined as one that meets the needs of the present, without compromising the ability of future generations to meet their own needs (UN, 1987), ensuring the proper balance between economic growth, environmental protection and social progress. Therefore, there are three pillars: social, ecological and economic[9] [10] -. Finally, the great role of criminal law is to function as a general *prevention of crimes* (*deterrence*), deterring individuals from committing them due to the real probability of being punished. The lack of adequate enforcement and enforcement of environmental crimes gives wrong behavioral incentives, which contribute to the degradation of the Amazon.

Part I

THE CURRENT FRAMEWORK:

The risk of forest perishing

I. CLIMATE CHANGE

[7] Human security is a multidimensional concept, centered on the individual, covering seven domains: (i) personal (physical integrity), (ii) economic (basic income), (iii) food (minimal nutrition), (iv) health (protection against diseases)), (v) community (protection of difference and identity values), (vi) political freedoms (rights, freedoms and participation) and (vii) environmental (protection against environmental degradation) (UN, 1994, pp. 3, 24 -33).

[8] Some milestones in this trajectory were the 1972 Club of Rome meeting, ECO 92, in Rio de Janeiro and the approval, in 2015, of the Sustainable Development Goals.

[9] Among the Sustainable Development Goals, approved by the UN, in 2015, Goal 15 provides as follows: "Protect, recover and promote the sustainable use of terrestrial ecosystems**, sustainably manage forests**, combat desertification, stop and reverse the degradation of land and halt biodiversity loss ".

[10] Institutions like UNESCO suggest a fourth pillar, which would be Education, including environmental. UNESCO, Sustainable development. Available at: <https://en.unesco.org/themes/education-sustainable-development/what-is-esd/sd>. Accessed on 24 jan. 2020. For a summary of the evolution of the concept of sustainable development in international law, see Varella, 2009, pp. 6-25.

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Since the first Industrial Revolution, in the middle of the 18th century, the Earth's temperature has been rising[11], a phenomenon identified as global warming or, more broadly, climate change[12]. Most scientists say that the phenomenon of climate change is mainly due to human action (NASA, s / d.a), although there are still skeptics and deniers[13]. The Intergovernmental Panel on Climate Change, created in 1988, within the scope of the United Nations, to consolidate scientific knowledge on the matter, considers that the probability of man being responsible for global warming is over 90% (IPCC, 2008). There is no doubt that the planet is in a warming phase and many of the consequences can already be felt in different parts of the world, such as the melting of the polar ice caps, the rising of the sea level, the extinction of species and the growing number of situations extreme climatic conditions (such as hurricanes, floods, droughts and heat waves). The main cause of global warming is the emission of greenhouse gases - which increase heat retention in the atmosphere - due, among other factors, to the burning of fossil fuels (NASA, s / db) and changes in use and coverage of soil, associated with agriculture, livestock, waste handling and deforestation (JIA; SHEVILAKOVA; ARTAXO, 2019, p. 133). And there comes the question of the Amazon, whose forest area has been reduced on a grand scale in recent decades. Tropical forests play an important role in climate mitigation, due to their carbon retention capacity, as already noted.

Three international documents sponsored by the UN have sought to directly address the problem of climate change: (i) the 1992 Framework Convention on Climate Change; (ii) the Kyoto Protocol, concluded in 1997, but which only came into force in 2005; and (iii) the Paris Agreement, in force since the end of 2016. A general assessment of the results obtained is scheduled for 2023. It is already anticipated that the emission reduction targets will not have been achieved and that, in addition, they have proved to be insufficient. The overall picture is aggravated by the United States' decision to withdraw from the Paris Agreement. It is not by chance, at the World Economic Forum 2020, in Davos, Switzerland, that the greatest concerns and discussions of political, economic and intellectual leaders gravitated towards global

[11] The global temperature has already warmed by 1ºC since the Industrial Revolution. And, according to estimates, it will have risen by 3ºC by the end of that century, surpassing the 2ºC ceiling set by the Paris Agreement and the announced effort not to exceed 1.5ºC.
[12] V. Romm, s/d.
[13] V. Open Source Systems, s/d; Demelle, s/d.

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warming, climate change and the loss of biodiversity (WORLAND, 2020). Symptomatically, as reported by the press, the star of the event was the young Swedish activist Greta Thunberg, and not the heads of state who attended there. Climate change and sustainability are themes that are finally entering the mainstream of world thinking, a fact that is already beginning to impact economic, financial, commercial and regulatory decisions. Divestment in fossil fuels is becoming a global requirement (CARRINGTON, 2020; FOSSIL FREE DIVESTMENT, s.d). And the demands for a "new capitalism", more human, ecological and egalitarian, are growing[14].

II. THE IMPORTANCE OF THE AMAZON FOREST

It is estimated that the Amazon Rainforest has existed for 55 million years (MORLEY, 2000), with news that it has been inhabited by humans for at least 11,200 years (ROOSEVELT; LIMA DA COSTA; LOPES MACHADO; MICHAB et al, 1996). It is the largest tropical forest in the world, which plays a critical role in the ecological balance of the planet, for multiple reasons. Firstly, for its extraordinary biodiversity, constituting the highest concentration of plants, animals, fungi, bacteria and algae on Earth[15]. It is unnecessary to emphasize that the felling of the forest produces the extinction of species, with unpredictable systemic consequences for the environment[16].

A second reason for the importance of the Amazon Forest is its role in the water cycle and in the rain regime, with implications throughout the South American continent, through

[14] Former Vice President of the United States, Al Gore, said: "The version of capitalism that we have today in the world needs to be reformed" ("The version of capitalism we have today in our world must be reformed"), as reported by Worland (2020), where he added: "It is pertinent to say that the official theme of this year's Davos meeting is" better capitalism ".

[15] It is estimated that there are about 60,000 species of plants in the region (of which 30,000 are higher plants, more than 2,500 species of trees), 2.5 million species of arthropods (insects, spiders, centipedes, etc.), 2,000 species of fish and 300 of mammals (CÂMARA DOS DEPUTADOS, 2019).

[16] In a recent interview with BBC News Mundo, biologist Sean B. Carroll, recalling pioneering research by Robert Paine, Jim Estes and Mary Power, cited several examples of completely unexpected hidden connections between creatures and nature, demonstrating the importance of so-called species- key to preserving biodiversity. It takes years of field research to identify them. Some examples, in varied ecosystems, are starfish, sea otters, certain types of river fish, whales or wolves. Some are predators, others are food, but all are indispensable for the preservation of other species. V. Ventura, 2020.

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evotranspiration[17] and the attraction and transfer of moisture from the oceans to the interior of the continent. Evotranspiration occurs when trees and plants absorb water from the soil to perform photosynthesis[18] and to cool. This water is released through the pores of the leaves, in the form of steam, becoming clouds (SMITH, 2019). The phenomenon takes place with great heat absorption from the surface, cooling the atmosphere and, at the same time, returning moisture to it. Moisture produces rain clouds that replenish the forest's own soil. In addition, the Amazon Forest attracts and transfers large volumes of moisture from the ocean to other regions through "flying rivers": atmospheric flows of steam that connect moisture-donor areas with moisture-receiving areas, contributing to irrigate other hydrographic basins[19].

Third, the forest plays an important role in mitigating global warming, absorbing and storing carbon dioxide through photosynthesis. As intuitive, with deforestation, it not only stops absorbing carbon but releases it back into the atmosphere[20]. Experts say, however, the belief that the Amazon is the "lung of the world" is not correct. The forest actually absorbs all the oxygen it produces. Strictly speaking, the term could be applied to algae in the oceans, which play a much more important role in the production of oxygen (SOLIGEN, 2010, p. 270).

III. STOPPING AND ADVANCING DEFORESTATION

Until the early 1960s of the 20th century, the Brazilian Amazon Forest remained virtually intact. The situation began to change at the turn of the 60s to the 70s, with the expansion of deforestation being due, above all, to the action of the Government itself, for the construction of roads, infrastructure, incentives to colonization and subsidies for agriculture

[17] Evotranspiration is the combination of two processes in the water cycle: evaporation of water from the soil and vegetation and transpiration of plants, releasing steam into the atmosphere.
[18] Explained in a simple way, photosynthesis is the transformation of solar energy into chemical energy. It is a process that requires sunlight, water and carbon dioxide. Plants (and some other organisms) absorb and combine these three elements, producing sugar (glucose) and oxygen. V. Science and Technology Concepts Middle School, 2017.
[19] V. Nobre, 2014, p. 18.
[20] It is also pointed out that large land areas covered by forests act as an obstacle to the formation of hurricanes and other extreme weather events. V. Nobre, 2014, p. 19-20.

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(CELENTANO ; SILLS; SALLES; VERÍSSIMO, 2012, p. 850). It was still a period of minimal environmental awareness. Between 1970 and 1990, 7.4% of the forest was deforested, with a loss of 303,712 km2, going from a pre-1970 area of 4,100,000 km2 to 3,796,288 km2 (BUTLER, 2018). Deforestation continued progressively until it reached its peak in 2004, when an area equivalent to 27,772 km2 was deforested (INPE, s.d.). In 2004, an ambitious program called the Plan for the Prevention and Control of Deforestation in the Amazon (PPCDAm) was launched, with initiatives in the institutional, legal and political fields (CAPOBIANCO, 2017). The plan was carried out in different phases, with measures that included (i) *monitoring* deforestation by satellite images in real time, (ii) effective *enforcement* to curb illegal logging and other violations, (iii) *combating* land grabbing, (iv) *creation* of conservation units (forest reserves), (v) *demarcation* of indigenous lands and (vi) *cut* of subsidized credits for producers who did not have land ownership or did not respect environmental standards[21].

The PPCDAm produced remarkable results: between 2004 and 2012, deforestation fell by more than 80%, going to less than 4,600 km2 (INPE, s / d). Brazil was the country that most contributed, in the period, to the mitigation of climate change (Kalunga, 2020). A fact worth noting is that deforestation is significantly lower in demarcated indigenous areas (HUMAN RIGHTS WATCH, 2019). Another important point is that the effective performance of the Public Power, with political will, coordination and visibility - including in the media - increased the perception of risk in non-compliance with environmental legislation with relevant intensity (CAPOBIANCO, 2017, p. 140).

The success of the measures inspired the belief that one could take a step forward, reaching the ideal stage of zero net deforestation (VERÍSSIMO, 2015). Unfortunately, however, as of 2013, the determination to comply with the PPCDAm has cooled and deforestation has grown again, reaching 7,536 km2 in 2018 (INPE, s / d). In 2019, almost 10,000 km2 was reached. In total, the accumulated deforestation in the last 50 years is about 800,000 km2,

[21] V. MMA, s/d.a; HRW, 2019; e Capobianco, 2000, p. 33.

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approaching 20% of the original area of the Brazilian Amazon (VERÍSSIMO, 2015)[22]. Deforestation tends to follow a constant dynamic: illegal logging, burning, occupation by farmers and producers (cattle and soybeans) and attempts to legalize illegal land grabbing. In the southeastern part of the forest, studies suggest that the dry season is becoming warmer and longer, in response to anthropogenic activity (BARKHORDARIAN et al, 2019). Scientists consider that if forest clearing reaches 40%, there will be a tipping point (NOBRE; SAMPAIO; BORMA; CASTILLA-RUBIO; SILVA; CARDOSO, 2016). And more recent studies point out that, once 20 to 25% of deforestation is reached, the Amazon will undergo irreversible changes, with a tendency to savanization (LOVEJOY; NOBRE, 2018). The consequences of a world without the Amazon are "catastrophic" for the planet and for Brazil. In addition to the increase in global warming, there will be a drastic reduction in rainfall, which, in the case of Brazil, is essential for agribusiness and energy generation (SALLES; ESTEVES, 2019). The scarcity of water will also compromise industry, the supply of populations and life in cities.

Part II

THE PATH OF DEGRADATION:

The perverse dynamics of forest destruction

I. ENVIRONMENTAL CRIMES

Environmental crimes are currently recognized as one of the most lucrative forms of transnational criminal activity, with the aggravation of being low the risk of punishment (UN, 2018)[23]. There is no single doctrinal definition for this type of crime. For the purposes of this study, an illegal crime or activity that harms the ecosystem, causing damage to the environment (soil, air and water), biodiversity (fauna and flora) or contributing to the

[22] However, it is worth noting that official deforestation data only identifies areas where the forest has been completely cleared. They do not account for degraded areas that, if considered, would imply much higher vegetation suppression.
[23] It is the fourth leading form of crime in the world, behind drugs, counterfeiting and human trafficking, amounting to between 91 and 259 billion dollars annually.

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depletion of natural resources is considered an environmental crime (organic or inorganic, such as fish, wood and minerals)[24]. In recent years, a new branch of criminology has been developed, identified as *green criminology*[25]. When committed on a large scale, environmental crimes require a structured criminal organization and a chain of economic agents that includes producers, intermediaries and buyers. Environmental crimes are often committed in connection with other crimes, such as money laundering, corruption of public officials, smuggling and slave labor. It is important to note that not all activities that cause environmental damage are treated by law as a crime - although they are regulated and may give rise to administrative infractions. Examples of such activities are: the widespread use of fossil fuels, the generation of energy by thermoelectric plants and landfills, to mention three of them that cause a relevant environmental impact.

There are countless environmental crimes in kind, typified in the legislation of different countries, including Brazil[26]. The following is the identification and description of the main ones, with emphasis on their impact on the Amazon region:

1. *Deforestation and fires*. Deforestation is a crime in itself, although it can be associated with several other crimes[27], as will be seen below. This is the main environmental offense practiced in the Amazon, according to data from criminal cases that reach the courts[28]. There are many causes that drive deforestation, including urbanization, the wood industry and the production of firewood and charcoal (this factor is more significant in African forests) (UN ENVIRONMENT PROGRAMME, 2018). However, the main agent of deforestation in the Amazon Forest is livestock, with the constitution of pastures on cattle ranches. Although on a smaller scale, agriculture also contributes to deforestation. Some crops that have been or are

[24] Elements of this definition are found in INTERPOL; UNEP, 2016.
[25] V. Lynch; Stretesky, 2012; International Green Criminology Working Group, s/d.
[26] In Brazil, environmental crimes are defined in Law No. 9,605, of 12 February. 1998, which classifies them in the following genres: (i) crimes against fauna, (ii) crimes against flora, (iii) pollution and other crimes, (iv) crimes against urban planning and (v) crimes against environmental administration.
[27] Law No. 9,605 / 98 (Law on Environmental Crimes), arts. 38, 39 and 40.
[28] Research carried out by the authors in the database of the Superior Court of Justice, based on the entry "crime $ adj2 ambient $ e (AM or RO or RR or PA or MT uo AC or TO)", referring to the period from 01/01/2010 to 01.01.2010. In the same vein, see Azevedo; Vieira, 2018, p. 262.

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associated with this crime are soy, rice and sugar cane in some regions. Despite strict legislation, deforestation occurs both on private and public lands, as well as in indigenous areas and in conservation units, although in the latter on a much smaller scale, as already noted[29]. The deficiency in inspection, repression and enforcement of judicial decisions contributes to this situation.

Burnings are, more often than not, causes or consequences of deforestation, many of which are criminal in nature[30], with the purpose of disposing of native vegetation and allowing livestock and agriculture[31], causing serious damage to the forest and the health of the population (ROCHA, 2017). In 2019, the situation became extremely serious, with a significant increase in outbreaks compared to previous years[32]. In the midst of great domestic and international wear and tear, with accusations of undue incentives and leniency in relation to forest fires, the Federal Government triggered Operation Green Brazil, which mobilized more than 9,000 women and men, including civilians and military, coordinated by the Ministry Defense. Official data support the operation's success in resolving the crisis (MINISTRY OF DEFENSE, 2019)[33].

[29] In lands of private ownership or possession, the so-called permanent preservation areas (APP) must have their vegetation entirely preserved, whereas in other lands, if located in forest areas, the observance of a legal reserve for the preservation of 80% of native vegetation cover. V. Forest Code - Law 12.651, of 25 May. 2012, arts. 7 and 12, I, a.

[30] Law No. 9,605 / 98 (Law on Environmental Crimes), art. 41: "Cause forest or forest fire: Penalty - imprisonment for two to four years, and a fine".

[31] V. Barlow et al, 2019; Vick, 2019. Three types of fires are identified: (i) post-deforestation: the vegetation is cut down, left to dry in the sun and then burned to prepare the land for livestock and agriculture; (ii) for agricultural or livestock purposes: ranchers burn to destroy weeds and farmers, including indigenous and traditional peoples, by using the cutting and burning technique; and (iii) forest fire: it occurs when the fires get out of control and invade the forest.

[32] According to the National Institute for Space Research - INPE, between August 2018 and July 2019, 9,762 km2 of forest were destroyed, an increase of 29.5% over the previous 12 months. (INPE, 2019). The outbreaks of fires rose 30% and reached 89 thousand (REUTERS, 2020).

[33] "Data from almost 40 days of Operation Verde Brasil indicate the mark of 1.7 thousand outbreaks of combated fires, 73 people detained and 237 terms of infraction drawn up, which resulted in the application of R $ 55 million in fines" (MINISTÉRIO DA DEFESA, 2019).

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2. *Extraction and illegal timber trade*. This is the second most practiced crime in the Amazon[34], according to research in the courts[35]. Although illegal logging is not the main cause of deforestation, it makes a decisive contribution, as it is the gateway to other criminal or illegal enterprises that are harmful to the Amazon Forest. The most important of these is the private appropriation of public land for sale in lots and the subsequent creation of cattle or use for agriculture. The removal of the highest and most valuable trees allows the passage of sunlight, drying the vegetation and making it more prone to burning, deliberate or natural (WALLACE, 2019). Loggers "wash" illegal wood using fraudulent documentation, which gives it the appearance of having been obtained in an area of legal exploitation (HRW, 2019). That is to say: because their potential is not adequately inventoried, licensed areas "produce" a volume of wood much higher than their real capacity. And thus, by covering up their illicit origin, they gain access to international markets, such as the European Union, the United States and China. It is estimated that 80% of wood production in Brazil is a product of illegal logging[36]. Some compare this market to that of drug trafficking (SOLIGEN, 2010, p. 265).

Illegal logging gives rise to a phenomenon distinct from deforestation, which is forest degradation. It is the gradual impoverishment of the forest, as a result of the selective cutting of nobler trees. As satellite monitoring only detects areas that are fully deforested, degradation is not always identified by this route, although it implies a profound imbalance in the ecosystem. Many of these trees are the preferred habitat for different birds, insects and mammals and their felling can cause species extinction and affect an entire biological chain (ISA, 2019b). Illegal logging involves criminal networks that have the logistical capacity to coordinate the cutting, processing and sale of wood on a large scale. In addition, such networks have the power to corrupt authorities and to employ armed militias (HRW, 2019, p. 28)[37]. There are social and political problems associated with this type of crime: there are cities that have up to 20 sawmills, which employ a few hundred workers and are the livelihood of

[34] Law No. 9,605 / 98 (Law on Environmental Crimes), arts. 45, 46 and par. single.
[35] Research carried out at the Federal Regional Court of the 1st Region by the authors, based on the entry: "crime $ adj2 ambient $ e (AM or PA or MT)". The survey was limited to the States of Pará, Mato Grosso and Amazonas, as well as the period from 01.01.2010 to 01.01.2020.
[36] INTERPOL; UNEP, 2016. There are even higher estimates, v. Farias, 2019.
[37] In this regard, an emblematic episode took place in Espigão do Oeste, in the state of Rondônia, on July 4, 2019, when a tanker truck carrying aviation fuel for environmental inspection helicopters was attacked and set on fire by local loggers. V. Wallace, 2019.

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their families. In addition, there is contamination of the policy by this illegal activity, as many of those involved are elected councilors, mayors and state deputies (HRW, 2019).

3. *Illegal mining and mining*. Illegal mining, especially gold, is present in almost all the states of the Brazilian Legal Amazon, camouflaged under the title "garimpo"[38]. In fact, although there is still a residual individual gold digger, with a pick and a bang, gold mining is nowadays done with heavy machinery, with a high financial cost and a high environmental impact, which includes rafts, dredgers and hydraulic excavators. (MPF, 2020, p. 8). Mining contributes to deforestation to a lesser extent than other human activities, such as cattle ranching and logging. Still, a recent study concluded that, between 2005 and 2015, it was responsible for about 10% of the loss of vegetation cover in the Brazilian Amazon (SONTER et al 2017)[39]. More than 90% of deforestation took place in illegal mineral exploration sites, that is, without a concession from the Brazilian Government (IONOVA, 2019). Currently, there are more than 450 areas in this situation (IONOVA, 2019), several of them, including, with clandestine airstrips (ISA, 2019a)[40]. There is no adequate control to distinguish between legal and illegal mining. Symptomatically, in 2019, gold became the most exported product in the state of Roraima, which has no mine operating legally (ASSOCIAÇÃO MINEIRA DE DEFESA DO ENBIENTE, 2019).

In addition to deforestation and scars on the land, there are other serious problems associated with illegal mining. One of them is the pollution of rivers, caused by the use of mercury in the exploitation of gold, contaminating the water and fish consumed by local populations[41]. Another problem is the invasion of protected areas and, above all, of indigenous

[38] Despite a certain legislative indeterminacy, it is possible to conceptualize gold mining as the activity of mineral extraction conducted by individuals, regardless of previous research, with rudimentary instruments and techniques and limited maximum area; whereas mining is an industrial activity, preceded by research, on a much larger scale, usually developed by specialized companies.
[39] See too Sullivan, 2017.
[40] "Today, only in the portion of the Indigenous Land (Yanomami) that occupies the State of Roraima, there are 14 clandestine landing strips for illegal mining" (ISA, 2019a).
[41] According to the World Health Organization, mercury is a highly toxic metal, being a dangerous substance for intrauterine life and child development in the first years of life. It is also capable of compromising the nervous, immune, digestive, respiratory and vision systems. The Minamata Convention, incorporated into Brazilian law, restricts its production and use. (MPF, 2020, pp. 173-174).

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lands, such as, for example, that of the Yanomamis (Roraima and Amazonas), Kayapós and Munduruku (both in Pará)[42], where there are a few thousand prospectors working. The Army has a decisive role in protecting these areas and, when it withdraws, illegal advancement occurs (ISA, 2019a)[43]. Mining in indigenous lands leads to silting up of rivers, conflicts over land, crime, disease and prostitution[44]. The Brazilian Constitution admits the possibility of exploring mineral resources in indigenous lands, but subject to the prior approval of a regulatory law, which was never enacted. In early 2020, the President of the Republic sent a bill on the matter to the National Congress[45], which was received with reservations and criticism by political, indigenous and environmental leaders (ÁLVAREZ, 2020).

4. *Poaching and animal trafficking*. Illegal hunting and trafficking in wild animals is the third or fourth most profitable illicit activity in the world, behind only drug and arms trafficking, and paired with that of people[46]. According to the World Economic Forum, it is a trade that moves between 7 and 23 billion dollars a year (LEHMACHER, 2016). Brazil, in turn, has one of the greatest fauna diversity on the planet. Among us, approximately 38 million animals are removed from the forests and forests per year, in a business that spans more than 1 billion dollars (BUCHERONI, 2019; RENCTAS, 2019). Federal Police operations in Amazonas seized, in 2018 alone, more than three tons of illegal hunting, hundreds of land animals and thousands of ornamental fish (INPA, 2018). Animal trafficking is aimed at different audiences and objectives, which include: (i) private collectors, who seek rare or endangered animals; (ii) scientific purposes, notably the production of medicines; (iii) sale in pet shops, as pets; and (iv) production of tradable goods, such as hides, skins, cosmetics and souvenirs (BUCHERONI,

[42] V. Fellet; Costa, 2019. The Amazon Georeferenced Social and Environmental Information Network (Raisg) identified illegal gold mines in 18 indigenous lands in Brazil.
[43] "Between 6,000 and 7,000 gold miners are illegally extracting gold from the Yanomami Indigenous Land, in the north of the country. (...) The illegal mining ... exploded ... after the Army deactivated the protection bases in the Uraricoera and Mucajaí rivers ... "(ISA, 2019a).
[44] V. Fellet; Costa, 2019.
[45] Bill 191/20 regulates the exploitation of mineral, water and organic resources in indigenous reserves. Available at: <https://www.camara.leg.br/noticias/634893-projeto-do-governo-viabiliza-exploracao-de-minerios-em-terras-indigenas/>. Accessed on 20 feb. 2020.
[46] According to the United States Department of State. V. Bergman, 2009. According to the UN, in a 2014 document, it would be the fourth, after human trafficking. V. UNODC, 2014.

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2019; RENCTAS, 2019). In addition to the risk of spreading diseases[47], the removal of animals from their natural *habitat* threatens species with extinction and can disrupt the balance of the ecosystem, removing predators or food from other species and compromising nature's cycles[48]. Illegal hunting and trade in animals is a low-crime, low-punishment crime[49] [50].

5. Other crimes

a) *Crimes against forest defenders*. Brazil has one of the highest homicide rates for forest defenders (BRITO et al, 2019, p. 1), including indigenous populations, traditional forest peoples, quilombolas, human rights activists and environmentalists (VASCONCELLOS, 2019). They are constant victims of landowners (often "grileiros"), gold miners, loggers and hired gunmen (GLOBAL WITNESS, 2018). According to the Pastoral Land Commission, linked to the Catholic Church, more than 300 people have been murdered during the last decade, in the context of conflicts over the use of land and natural resources in the Amazon (HRW, 2019, pp. 3-4) . Two martyrs of this clash were the leader of the rubber tappers Chico Mendes, who died in 1988, in the State of Acre, and the American missionary Dorothy Stang, victim of homicide in 2005, in the State of Pará.

b) *Land grabbing*. The invasion and occupation of public lands, especially in forest areas, has been a constant in the Amazon. As already described, after selective logging, removal and burning of the remaining vegetation, public areas are transformed into pastures and plantations. Subsequently, land grabbers seek to legalize ownership, dividing the area into smaller lots, easier to regulate under the terms of the legislation, or simply falsify titles and property records, with the collusion of notaries and public agents (IPAM, 2006). The private

[47] Such as avian flu (avian flu) and Ebola virus, among others. V. Can; D'Cruze; Macdonald, 2019; Travis; Watson; 2011.
[48] For example: "Along with the extinction of the fauna, the entire ecosystem stops with the trafficking cycle. The decrease in predatory seed species favors the dominance of some trees, as well as the absence of dispersers affects the reproduction of flora. In this way, the entire forest structure is changed". V. Bucheroni, 2019.
[49] In Brazil, the base penalty is 6 months to 1 year, and a fine. Law No. 9,605 / 98 (Law on Environmental Crimes), art. 29, caput and §§ 4th and 5th.
[50] The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which seeks to regulate trade in species, has been in force since 1973. However, it is not easy to enforce it effectively and sanctions against countries for violation of the Convention are rare. V. Fobar, 2019.

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appropriation of public lands, in spite of land tenure bodies, such as the National Institute of Agrarian Reform - INCRA, assumes an important political, social, economic and environmental dimension, considering that approximately 45% of the Amazon's lands were not officially destined, either for settlements for agrarian reform purposes or for environmental protection (IPAM, 2006)[51]. According to data from the Environmental Research Institute of the Amazon - IPAM, 30% of the deforestation in the Amazon, between January 1 and August 20, 2019, occurred on non-intended public lands, which are precisely the areas targeted by land grabbers (IPAM , 2019). In 2001-2002, the Parliamentary Commission of Inquiry of the Chamber of Deputies identified some of the purposes of land grabbing: reselling the land, using it as a guarantee for obtaining financing, donating in payment of social security and tax debts and obtaining indemnities in the expropriations for agrarian reform or for the creation of protected areas (CÂMARA DOS DEPUTADOS, 2001, pp. 353-357). To complete this tragic cycle, from time to time, the Government grants amnesty to these invasions and allows the legalization of private appropriation of public lands, as will be seen below.

c) *Biopiracy*. Biopiracy is a new name for an old problem, a continued expression of colonialism, now of a technological nature. It consists of diverse activities and behaviors, which include not only the unauthorized withdrawal of species of fauna and flora, but, above all, in the case of the Amazon, the unauthorized appropriation of traditional knowledge of indigenous and forest peoples. In the latter case, we seek to patent chemical substances and active ingredients that originate in the region or whose initial knowledge came from local communities, privatizing or monopolizing something that, at least in part, constitutes a collective asset for others. In other cases, we try to register natural forest products as our own brand. In the hypothesis of illegal fauna trade, there is no doubt that there is a crime, as seen above. Not so, however, in situations where traditional knowledge of native populations is used, which are not subject to specific criminal classification[52]. There are several examples of

[51] The situation has not changed significantly since then, although new conservation units have been created.

[52] It is true that the 1992 Convention on Biological Diversity sought to ensure the fair and equitable sharing of benefits from countries' genetic diversity genetic resources. The convention, however, has no criminal rules and its practical effects are still limited.

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biopiracy around the world[53]. Regarding the Brazilian Amazon, two cases became famous: the removal and smuggling of rubber seeds in 1876, which had a devastating impact on the local economy (ABREU et al, 2019, p. 32); and the registration, in Japan, of the brand *Açaí*, a typical fruit of the region. The registration was canceled (FERNANDES, 2017, p. 242). A similar situation also occurred with the *Cupuaçu* brand, which also had its registration in the international market destroyed (NOGUEIRA; SIQUEIRA; SOARES, 2010, pp. 151, 152). More recently, the consensus has been consolidated that one of the best ways to face biopiracy is to invest in local scientific and technological research. Ahead will return to the point.

d) *Slave labor, human trafficking and solicitation*. Contemporary slavery in the country, especially in the Amazon agricultural frontier region, benefits from the scarcity of regular jobs and the existence of a contingent of workers without special qualifications[54]. A recurring approach is the use by farmers of the figure of "cats", recruiters of labor, who entice vulnerable rural workers and take them to remote regions. Commonly, the job offer offers benefits that do not correspond to reality - such as food, salary and accommodation guarantees -, converting the worker into a debtor, through the purchase of products and services from the employer himself. Cats also use physical, moral and confinement violence as ways to keep employees in such a condition (ILO, 2011, pp. 16-17; Cacciamali; Azevedo, 2011, pp. 943-948; ILO, 2010, pp 48-53).

II. REGULARIZATION OF GRILLAGE, CORRUPTION AND IMPUNITY

[53] See, illustratively: (i) andiroba, an Amazonian tree, had oil and extract of its fruits registered by the French company Yves Roche and by the Japanese company Masaru Morita; (ii) copaíba had patents registered by the American company Aveda and by the French company Technico-flor; (iii) the espinheira santa has a patent for a medicine titled by the Japanese Nippon Mektron; (iv) jaborandi is the subject of a patent registered by the German pharmaceutical company Merk. V. Fernandes, 2017, p. 242.

[54] The Brazilian Penal Code typifies crimes of slave labor, human trafficking and solicitation (arts. 149, 149-A and 207).

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As already anticipated, one of the important incentives for deforestation in the Amazon comes from the government itself, both federal - predominantly - and state[55]. The statement refers to the dynamics of the invasion-regularization of public lands. To understand the issue: areas that are not private property, nor demarcated indigenous reserves or conservation units, constitute public property, also referred to as unassigned areas. Part of these public areas correspond to settlements created by the Government for the purpose of agrarian reform, where small farmers were installed. In fact, due to their lack of inspection and compliance with legislation, preservation duties are not properly observed and deforestation is high (IPAM, 2016, pp. 41 ff.). However, the most serious situation is in the "land grabbing", with the occupation and privatization of public areas of the Amazon Forest, often with violence against indigenous communities or traditional populations. In relation to this, there are two problems with government policies. The first is that, by not properly inspecting, the State allows these areas to be invaded, initiating the cycle of clearing the forest: illegal extraction of wood, burning and occupation of the soil. The second problem: under pressure from politically supported invaders, the Federal Government, from time to time, grants amnesty and allows the regularization of this appropriation of public lands.

In fact, that was the case with Law 11,952 / 2009, under the Government of Luís Inácio Lula da Silva, with Law 13,465 / 2017, under the Michel Temer Government, and with Provisional Measure 910, of December 11, 2019, edited by the President Jair Bolsonaro. In fact, for opposing this policy, the president of the National Institute for Colonization and Agrarian Reform - INCRA (HANBURY, 2019)[56] was exonerated. These laws are part of the old Brazilian logic in which the wrong things become fait accompli and then they try to legitimize them. In fact, more than legitimizing the appropriation of public lands, such measures encourage the continuity of the practice, fostering the vicious circle of invasion, deforestation and regularization. The new Provisional Measure, following the example of the previous law, allows the acquisition of these lands through the payment of values well below those of the

[55] Laws regulating recently occupied lands, upon payment of insignificant amounts, were approved by the States of Pará, Mato Grosso and Amazonas (BRITO, 2019).
[56] "According to the media, (General João Carlos de Jesus) Corrêa was fired for being against the Boslonaro government's plan to facilitate the process of regularizing around 750 thousand land titles" (HANBURY, 2019).

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market, generating losses for the Union of several billion reais. It also works as an incentive for the continuation of the invasions, since it confirms a trend towards the later regularization of the invaders' property (BRITO et al, 2019, p. 2).

After the arson episode of a fuel truck in Espigão do Oeste, the Brazilian Institute for the Environment and Renewable Resources - IBAMA organized a major reaction operation to suppress illegal logging and sawmills used by such loggers. 35 IBAMA agents, 50 police officers and around 100 Army soldiers were assembled. When the convoy of police cars and military trucks was on its way, after leaving Porto Velho, one of the agents, when accessing the social network, came across an interview with the leader of the loggers discussing the operation, which was confidential. It became evident that someone from within the institutions responsible for suppressing deforestation had leaked the information (WALLACE, 2019). This is another of the problems faced: the corruption - and politicization - of public agents responsible for environmental protection and, also, very intensely, of notaries and property registry officers, accused of forging documents and property records. There are also relevant complaints regarding the performance of the Judiciary (CÂMARA DOS DEPUTADOS, 2001, pp. 358-363)[57].

Impunity is the general rule in relation to crimes associated with deforestation in the Amazon. According to a Human Rights Watch report, of the more than 300 murders recorded by the Pastoral Land Commission since 2009, only 14 have been brought to trial (HRW, 2019, pp. 5-6). It is worth saying: defenders of the forest, such as indigenous people, local populations, human rights activists, environmentalists, missionaries and even IBAMA agents are constant victims of crimes that are not even investigated. On the other hand, notaries and registrars responsible for fraudulent public deeds and registrations without previous domain title or in duplicate rarely answer for their acts (CÂMARA DOS DEPUTADOS, 2001, pp. 358-363)[58]. Loggers pay bribes for false documents attesting that the wood comes from a licensed area and public officials who receive these illicit advantages also often escape the rigors of the

[57] Despite being an old diagnosis, the pathologies remain the same (BARRETO; MESQUITA, 2009).
[58] Despite being an old diagnosis, the pathologies remain the same.

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law. Only a very small percentage of the fines imposed by IBAMA for environmental violations are actually collected[59]. In addition to all this, the regularization laws mentioned above. In this dramatic scenario of leniency by the Public Power, corruption and impunity, the Amazon Forest is often helpless.

III. THE DRAMATIC WEAR OF BRAZILIAN ENVIRONMENTAL POLICY

Empirical research shows that the active presence of the Public Power, with personnel, equipment and political will, is a decisive factor in curbing deforestation. Especially because forest destruction is supported by illegal practices and, frequently, "banditry" (ABRAMOVAY, 2019, p. 11). The historic reduction in deforestation, which occurred between 2004 and 2012, was due, above all, to the severe inspection implemented, with effective field action, involving arrests, seizures and fines (CAPOBIANCO, 2017, p. 118). That is to say: environmental command and control policies were indispensable to interrupt the cycle of violence and destruction (ABRAMOVAY, 2019, p. 11). The monitoring and information transmission process - which guided inspection operations -, the creation of conservation units and the demarcation of indigenous lands also played an important role. In the latter case, due to the fact that the lands inserted in these protected areas lose their value, insofar as it is not possible to obtain title over them, discouraging land grabbing (CAPOBIANCO, 2017, p. 120). Well, it was precisely the loosening of inspection that allowed, from 2013, the deforestation rate to grow significantly again.

The situation worsened throughout 2019, with an increase of 30%, in contrast to the previous year, reaching the mark of 9,762 Km2 (INPE, s / d)[60] [61]. Environmental organizations, defenders of the forest and scientists attributed this increase to the attitudes of the new

[59] It appears on the Portal of the Federal Court of Accounts, in the statement of collection of administrative fines, between 2005 and 2009, that less than 1% of the fines imposed by IBAMA were actually collected (Source: TCU, 2010). The picture has not changed over time. V. Bárbara Libório, 2019.
[60] Previous news reports pointed to a much higher volume. V. AFP, 2020. Deutsche Welle, 2020.
[61] In indigenous lands, this increase was even more expressive, in the percentage of 80%, when compared to 2017-2018 (ISA.a, 2019).

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Government[62], pointing, amid other complaints, public statements by high authorities that signaled disinterest in the environmental issue[63], associated with concrete acts that implied a substantial change in public policies necessary for the prevention and control of deforestation (ESTADÃO CONTEÚDO, 2019). Such behaviors would have contributed to increase the boldness of loggers, miners and land grabbers in the understanding of environmental organizations[64].

Among the acts mentioned above, we can list: (i) the extinction of the Secretariat for Climate Change and Forests of the Ministry of the Environment (MMA)[65], (ii) the extinction of the General Secretariat for the Environment, Energy and Science and Technology from the Ministry of Foreign Affairs[66], (iii) the dismissal of numerous state superintendents from the Brazilian Institute of the Environment (IBAMA)[67] and their replacement by people allegedly not committed to environmental causes (FORTE; CARVALHO; RODRIGUES, 2020); (iv) the reduction in the number of members of the National Environment Council (CONAMA), with an impact on the representation of non-governmental organizations (NGOs), states and civil society[68]; (v) the transfer of the Brazilian Forest Service to the Ministry of Agriculture, Livestock and Supply (Ministry of Agriculture)[69], to which the defense of conflicting interests is attributed; (vi) the change in the competence to demarcate indigenous lands, with their migration from the National Indian Foundation (FUNAI) to the Ministry of Agriculture[70]; (vii) the manifest hostility

[62] "The Bolsonaro government has acted aggressively to reduce the country's ability to enforce its environmental laws"; according to the coordinator of the public policy campaign at Greenpeace Brasil, “the government has an agenda for environmental dismantling and destruction” (HRW, 2020, p. 10). V. Rosa, 2020; researcher Carlos Nobre stated: "The agenda is no longer of interest, as it was since 1992, with all the governments we had, with various political parties".

[63] As an illustration, mention is made of the President of the Republic's statements about abandoning the Paris Agreement, extinguishing the Ministry of the Environment, as well as the country's resignation from hosting, in 2019, the United Nations Conference on Climate Change (COP 25) . V., respectively: Darby, 2018; Stachewski, 2019; and Vilela, 2018.

[64] “Since January 2019, the federal government has been issuing signs that are read, at the local level, as permission to advance the invasion of public lands and curb state actions that seek to combat these criminal practices” (ABRAMOVAY, 2019, p. 13).

[65] Decree nº 9.672, of January 2, 2019.

[66] Decree No. 9,683, of 9 January 2019.

[67] Ordinances No. 107 to 127, of February 28, 2019.

[68] Decree No. 9,806, of May 28, 2019.

[69] Decree nº 9.667, of January 2, 2019.

[70] Provisional Measure No. 870, of January 1, 2019, converted into Law No. 13,884, of June 18, 2019. The provisional measure, in this specific part, was not approved by the National Congress. An attempt to reissue it, in turn, was considered unconstitutional by the Federal Supreme Court.

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towards non-governmental organizations that work alongside defenders of the forest (HRW, 2019, pp. 5,6); and, finally, (viii) the extinction of the Orientation Committee of the Amazon Fund, which was responsible for establishing the criteria and monitoring the application of the Fund's resources[71]. This last act aggravated Brazil's diplomatic crisis with Germany and Norway, the two most important financers of actions aimed at environmental protection in the Amazon, leading to the suspension of new donations, after such countries have allocated billions of reais to the cause.

Then, in February 2020, apparently seeking to signal a change in attitude, the Government transferred the National Council for the Legal Amazon from the Ministry of the Environment to the Vice Presidency of the Republic. The Council has, among its purposes, to coordinate the various Ministries and government agencies that take care of the environmental issue, as well as to propose policies and initiatives related to the preservation, protection and sustainable development of the Legal Amazon. It will be necessary to wait to see if the country will be able to recover from the break in the world image in this matter and succeed in drastically reducing deforestation, so that the desirable goal of zero net deforestation can return to society's radar[72].

Part III

SOME PATHS FOR PRESERVATION:

The forest is worth more than standing

I. THE FAILURE OF DEVELOPMENT MODELS ADOPTED HERE

Two diametrically opposed ways of dealing with the Amazon Rainforest have been adopted since the early 1970s. The first can be called developmentalist, which consists of

[71] Decree No. 9,759, of April 11, 2019.
[72] Decree No. 10,239, of February 12, 2020.

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cutting down the forest to occupy the area with economic activities such as livestock, agriculture, logging, mining and hydroelectric power plants. This conception does not take into account the serious consequences of the destruction of the Amazon biome[73]. The second can be identified as an environmentalist, due to its emphasis on keeping the forest intact, with the institution of large protected areas, represented by the demarcation of indigenous lands and the creation of conservation units (PRESIDÊNCIA DA REPÚBLICA, 2004). Neither model was able to extract the best economic and social potential from the Amazon, whose GDP represents 8% of the national total, with some of the worst social indicators in the country (VERÍSSIMO, 2015)[74]. From the mid-2000s, it was believed that a hybrid formula was possible, which reconciled the exploitation of economic activities with the preservation of the forest (PRESIDÊNCIA DA REPÚBLICA, 2004). However, deforestation boundaries continued to expand (NOBRE et al, 2016, p. 10759). In the current quarter, an idea referred to as third way or Amazon 4.0, expressions referring to the development of a forest economy, sustainable and fair for local communities[75], has been gaining strength. Next, all of these models are discussed.

1. Developmental model: cutting down the forest to exploit economic activities

The effective occupation of the Amazon began in the mid-1960s, driven mainly by a geopolitical concern: that of integrating it into the national territory, making the area populated and the State present. The underlying objective was to ensure the country's sovereignty over the forest and its natural resources (BECKER, 2001, pp. 135-136). From then on, the policy of encouraging producers and workers from different parts of Brazil to settle in the region began. To this end, tax incentives, credit facilitation and cheap land were offered

[73] Biome is a geographic space with its own characteristics of climate, vegetation, fauna, altitude and other factors. According to the Ministry of the Environment, Brazil is made up of six diverse biomes: Amazon, Caatinga, Cerrado, Atlantic Forest, Pampa and Pantanal (MMA, s / d.b).

[74] "In 1970, when the rate of deforestation in Amazonia began to accelerate, the region generated just under 8 percent of Brazil's gross domestic product. Today, 45 years later, after all the deforestation occurred, after the emergence of all cattle farms and mining projects and urban centers, the Amazon region still produces the same 8 percent of the Brazilian GDP "(VERIFYING, 2015).

[75] According to Beto Veríssimo (2020, pp. 5-6), the development cycles of the Amazon can be didactically summarized in the following typology: Amazônia 1.0 (Velho Extrativismo); Amazônia 2.0 (Agriculture); Amazônia 3.0 (Agroforestry systems and tourism); and Amazônia 4.0 (Bioeconomics and environmental services).

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(MAHAR, 1978, pp. 107-169; ALMEIDA, 1992, pp. 20-25). Roads started to be opened to allow the flow of production, with the inevitable consequence of the occupation and deforestation of its margins and the impact on the ecosystem. Gradually, what is now known as the "arc of deforestation" began to form, where there is intense suppression of the forest, with great sources of heat[76]. Many leaders still believe, today, that deforestation is synonymous with development[77]. It is well to see, however, that the Amazonian soil is not, in general, a rich soil, and depends on the vegetation cover and the climate for its own preservation (NOBRE et al, 2016; MAHAR, 1978, pp. 122- 127). Among the criticisms of the integration process adopted in the Amazon are, in addition to environmental degradation, the formation of large[78] estates and the failure to require that at least part of the gains obtained be reinvested locally (MAHAR, 1978, pp. 107-169; ALMEIDA , 1992, pp. 122-127).

The fact is that, over time, agribusiness has consolidated itself as the main economic activity in the country (CEPEA, 2020), with an expressive participation of production from the Amazon. The figures are impressive: Brazil is the largest exporter of soybeans in the world, producing around 30% of the total existing supply (STABILE et al, 2020, p. 1)[79]. Approximately 58.5% of this production is destined for the international market, with 12% originating in the Amazon biome (FEBRABAN; FGV EAESP, 2018, pp. 28-36). With regard to livestock, the country has the largest cattle herd on the planet and is responsible for approximately 15% of the beef consumed worldwide (STABILE et al, 2020, p. 1). Well, 40% of the animals and a significant part of the slaughterhouses are located in the Legal Amazon (FEBRABAN; FGV EAESP, 2018, pp. 13-

[76] The Arc of Deforestation - or Arch of Dense Population - extends from the west of the State of Maranhão, passing through Tocantins, part of Pará and Mato Grosso, all of the State of Rondônia, the south of Amazonas reaching Acre. It is the region that concentrates the highest deforestation rates in the Amazon, approaching 75% of the total. The design of this arch was initiated by the Belém-Brasília and Cuiabá-Porto Velho highways, and increased in size with the expansion of the highways, which radiate deforestation into the interior of the forest. V. ISA, 2019c.

[77] Check out, in this regard, a statement by Assuero Doca Veronez, president of the Agriculture Federation of Acre: "Deforestation for us is synonymous with progress, no matter how much it may shock people". And he added: "[O] Acre has no ore, has no tourist potential, what it does have are the best lands in Brazil. But this land has a problem, a forest on top "(WENZEL, 2020).

[78] Tax incentives enabled few companies to acquire large areas of land at very low prices and were responsible for the formation of large latifundios with public money (MAHAR, 1978, p. 160).

[79] According to data from the Food and Agriculture Organization of the United Nations (FAO), in January 2018, the amount of soybeans produced by Brazil corresponded to 34% of the total soybeans of the world. Available at: <http://www.fao.org/faostat/en/#compare>. Accessed on 01 apr. 2010.

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37; BARRETO et al, 2017). About 20% of beef production is destined abroad (FEBRABAN; FGV EAESP, 2018, pp. 13-37)[80]. It is estimated that livestock is the main responsible for the deforestation of 80% of the areas of the Amazon (PRESIDÊNCIA DA REPÚBLICA, 2004, p. 10)[81]. The truth, however, is that there is no necessary relationship between agribusiness and deforestation: in the period when forest destruction declined by 80% (between 2004 and 2012), the results practically tripled (NOBRE et al, 2016, p. 10760). And this was not only due to prices on the international market. In addition, studies indicate that agribusiness productivity in the Amazon is lower than that achieved in other areas[82] and that it can be substantially increased, keeping the land already occupied, through adequate investment, technology and management (STABILE et al, 2020, p. 4).

The economic logic that favors deforestation is also present in the low-income population, among small producers and in settlements. These groups suffer from low productivity, due to the lack of basic infrastructure, low access to technology, technical assistance and markets. They remove vegetation cover, promote fires, deplete the soil and migrate in search of new areas. It is estimated that agricultural settlements are responsible for approximately 30% of deforestation in recent years (STABILE et al, 2020, p. 4)[83]. Reducing deforestation in this section of the population depends on the development of public policies to assist their production and / or the creation of economic alternatives that offer them other income opportunities. As these small producers are, the struggle is for survival and the short-term vision prevails. Even though deforestation and fires (or, even, the extraction of wood and illegal mining) cause the exhaustion of the soil, they are the instruments that allow their

[80] According to the study, 81% of production is destined for the domestic market and 19% is exported to the foreign market, with the main destinations being China, Egypt, Russia and Iran.
[81] In the words of the document: "Livestock is responsible for about 80% of all deforested area in the Legal Amazon" (PRESIDÊNCIA DA REPÚBLICA, 2004, p. 10). A study by the Institute of Man and the Environment of the Amazon - IMAZON states that "livestock remains the main occupation of deforested areas in the Amazon, occupying 75% to 81% of the total deforested between 1990 and 2005". V. Barreto; Pereira; Arima, 2008, p. 20.
[82] The 2016 work notes that agricultural production in the Amazon represents 14.5% of the sector's domestic product, using an area of 750,000 km2 of deforestation; while São Paulo is responsible for 11.3% of the gross agricultural product, making use of an area of approximately 193,000 km2. (NOBRE et al, 2016, p. 10759).
[83] In October 2019, 32% of deforestation was recorded in settlements. V. IMAZON, 2019.

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immediate subsistence[84]. Thus, it is noted that there is an economic logic in the devastation of the forest. As long as this economic logic is not addressed, the pressure on the forest will persist.

2. Environmental model: emphasis on maximum forest preservation

In contrast to the previous one, there is a second model of occupation of the Amazon whose primary focus is the preservation of the forest, its fauna, flora, rivers, peoples and traditional cultures. To this end, the aim is to create areas that are intensely protected and regulated, so that most of the Amazon biome is protected perpetually. Within this logic is the creation of large conservation units - which include national parks, biological reserves, national forests and areas of environmental protection - as well as the demarcation of indigenous lands. Conservation units, which are regulated by law approved in the year 2000, can be (i) *fully protected*, which are intended to maintain ecosystems free from any changes caused by human interference[85]; and (ii) *sustainable use*, focused on the exploitation of nature's assets in order to guarantee the sustainability of ecological resources and processes, in a socially just and economically viable way[86]. The conservation units protect the *habitat* and way of life of the traditional peoples of the forest, protect biodiversity and preserve the economic potential of the Amazon biome.

[84] Studies indicate that the arrival of deforestation causes a heating of the local economy and opportunities for work and income for the population. This boom, however, is followed by an economic fall, "bust", indicating that the growth produced by deforestation is not maintained. One of these studies notes, however, that after the fall, the local economy partially recovers. In any case, what matters for the present work is that the immediate increase in income opportunities, for communities marked by scarcity, may be sufficient to trigger the logic of deforestation. Therefore, it is necessary to build alternatives for these communities. V. Celentano; Sills; Salles; Veríssimo, 2012, p. 850-864; and Rodrigues et al, 2009, p. 1435-1437.

[85] Law no. 9,985 / 2002, art. 2nd, I, and arts. 8th to 13. The group of integral protection conservation units is made up of ecological stations, biological reserves, national parks, natural monuments and wildlife refuge, each with specific characteristics.

[86] Law no. 9,985 / 2002, art. 2nd, I, and arts. 14 to 21. The group of conservation units for sustainable use consists of the following species: environmental protection area, area of relevant ecological interest, national forest, extractive reserve, fauna reserve, sustainable development reserve and private reserve of natural heritage.

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Indigenous lands, on the other hand, formally belong to the Union, but, under the terms of the Constitution, the "Indians" have original rights over the areas they traditionally occupy, and the federal government is responsible for demarcating and protecting them[87]. Ordinarily, indigenous peoples develop a use compatible with their traditional culture, which values the sustainable use of natural resources and the protection of nature. As already pointed out, the exploitation of water resources and energy potential, as well as the research and mining of mineral wealth in indigenous lands, depend on authorization from the National Congress, on behalf of interested communities and the guarantee of their participation in the results[88]. The creation of such areas is an obstacle to the uncontrolled advance of economic activity. In 2019 data, indigenous lands totaled 723 areas, 424 of them in the Amazon. In terms of extension, 98% of these areas are in the Legal Amazon, representing 23% of its territory (GDP, 2019). The demarcation of indigenous lands legitimately occupied by native populations has an immanent justice component and a utilitarian one: it preserves the lives of such peoples, protects rights that come from time immemorial and contributes to environmental preservation, which benefits all of humanity. However, there are severe critics of public demarcation policies[89].

In 2004, in the face of advances on the forest and under international pressure, Brazil launched the Action Plan for Prevention and Control of Deforestation in the Amazon Region (PPCDAm) (MMA, 2016b), with the stated objectives of continuously and consistently reducing the deforestation and create the conditions to establish a sustainable development model in the Legal Amazon. The Plan was structured in four phases, articulated around four axes: (i) land and territorial planning; (ii) environmental monitoring and control; (iii) fostering sustainable productive activities; and (iv) economic and regulatory instruments. In the first phase of the PPCDAm, between 2004 and 2008, the land and territorial ordering axis achieved the greatest success, with the creation of more than 25 million hectares of federal conservation units and the approval of 10 million hectares of indigenous lands (MMA, s / da)[90]. In the second phase, from 2009 to 2011, the monitoring and control axis was largely

[87] Constitution, art. 231.
[88] Constitution, art. 232.
[89] Among them, the current President of the Republic, Jair Bolsonaro. V. Oliveira, 2020.
[90] The member states of the region also contributed another 25 million hectares of protected areas.

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responsible for the fall in deforestation rates, due to the efficiency of the monitoring system and the agility of the integrated actions to monitor and combat organized crime, taken to effect by IBAMA, Federal and Highway Police, National Public Security Force and support from the Army (MMA, s / da). In 2009, the National Policy on Climate Change (PNMC) was also approved, whereby Brazil adopted the voluntary national commitment to reduce between 36.1% and 38.9% of its projected carbon emissions by 2020[91].

Although all four axes were to be implemented simultaneously, the first two phases of the PPCDAm aligned with the environmental model of emphasis on forest preservation.

3. The hybrid model: the difficult balance

The third axis of the PPCDAm - fostering sustainable productive activities - aims at the development of compatible economic activities that are compatible with the preservation of a balanced environment. It is a middle ground that seeks not to be indifferent to the economic and social needs of producers and workers in the region, but that does not neglect the pressing need to protect the forest. As noted, the first two stages of the Plan were successful in containing deforestation. As a result, the demands for economic alternatives for the population intensified, since the containment of illicit activities ends up resulting in some degree of disruption of their means of subsistence. The report evaluating the implementation of the third stage (2012-2015) noted the success of the plan in reducing deforestation, but noted that the axis of actions for sustainable development had achieved a low degree of success and that this is an essential chapter so that the effort to promote deforestation persists over time (ECLAC; IPEA; GIZ, 2011). It is not by chance that, as of 2015, with the country's economy slowing down, the levels of deforestation increased again, following a progressive pace in the years 2016, 2017 and 2018. In 2019, the increase was 30% in relation

[91] Law no. 12,187 / 2009, art. 12.

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to the previous year[92], including reaching indigenous lands and conservation units (INPE, 2019).

The main land categories in the Amazon, in relation to public areas, are the conservation units, indigenous lands, agrarian reform settlements and the so-called undeveloped areas or areas. In the areas of private titling, in general, what is required is respect for the legal reserve and permanent preservation areas. The main economic activities in the region are livestock, agriculture and extraction, including wood production. What is at issue is to make such activities compatible with the preservation of the forest and the environment in general. For this purpose, in the third phase of the PPCDAm, the focus on promoting sustainable economic activities was aimed at: (i) promoting the viability of *supply chains* that are alternatives to deforestation[93]; (ii) to promote good agricultural practices, including substituting the use of fire; (iii) increase the production and sale of wood through sustainable forest management, with the expansion of concessions; and (iv) promoting sustainable productive activities in settlements and family farming (MMA, 2013, p. 71). As agriculture is the main economic activity and the main driver of deforestation, it is particularly important to improve productivity per hectare[94] and to recover pastures and degraded surfaces, thus avoiding pressure on the forest to open new areas. for breeding or cultivation. According to scholars, almost 70% of the deforested areas are underutilized and there are some millions of abandoned hectares. With the use of technology, the land that has been deforested is more than enough to sustain, for the next decades, farms, mining and even hydroelectric projects (VERÍSSIMO, 2015, p. 3).

[92] Instituto Nacional de Pesquisa Espaciais – INPE. PRODES – Amazônia: Monitoramento do Desmatamento da Floresta Amazônica Brasileira por Satélite. Disponível em: <http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes>.Acesso em 1 mar. 2020.

[93] Production chains are the sum of operations to obtain and sell a raw material until it reaches the end user. In agricultural production, it consists of the following stages: acquisition of inputs and seeds, planting, cultivation, harvesting, transportation, storage, processing and marketing. V. Vial; Sette; Selito, 2009.

[94] Livestock still has low productivity and low utilization. The average stocking rate for livestock in the Amazon is still very low, between 0.5 and 1.0 animals per hectare (MMA, 2013, p. 65).

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Encouraging sustainable activities (with land regularization, technical assistance and access to technological means), awareness of the harmful effects of fire (impoverishes the soil in the long run, emits greenhouse gases and causes forest fires), better use of the soil, recovery of areas degraded land and reoccupation of abandoned land are some instruments, alongside monitoring, inspection and repression, which can be used to curb deforestation in the Amazon. However, as the data above demonstrates, the hybrid model was unable to contain the economic logic of destruction. The preservation of the forest, therefore, will require, in addition to all the efforts described so far, bold, creative, original solutions that demand, among other things, valorization of traditional local knowledge and heavy investment in science and technology.

II. A NEW DEVELOPMENT MODEL: THE FOURTH INDUSTRIAL REVOLUTION AND THE FOREST BIOECONOMY

Over time, the Amazon has experienced economic activities of low environmental impact, such as non-timber forest production - açaí, babassu, rubber, Brazil nuts - and of high impact, such as agribusiness, timber extraction and mining. The truth is that there has been no significant change in the region's economic, social and human levels, although the devastation of the forest has reached close to 20% of the total area. Given this situation, scientists dedicated to the study of the Amazon have sought to develop new ideas for old challenges, betting on the combination of socio-biodiversity with new technologies.

It is worth recalling here that, until the end of the 20th century, the world went through three major industrial revolutions: the first of them is symbolized by the use of steam; the second, for electricity; and the third, through the internet, the world wide web, connecting billions of people around the world in real time[95]. The fourth industrial revolution is already underway (SCHWAB, 2017; SCHWAB, 2015), the product of the fusion of information technology and biotechnology, in a world marked by the advancement of artificial intelligence

[95] V. Barroso, 2019, p. 1277.

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and its developments, such as the internet of things, *drones*, cars autonomous, robotics, nanotechnology, 3-D printing, among many other advances. The application of these innovations, inventions and modernities to develop a new economic model for the Amazon has been pointed out as the way of the future and the redemption for the region.

The bioeconomy is an economic model that prioritizes sustainability. It is based on innovations in the field of technology and biological sciences, with a view to decreasing the dependence on non-renewable resources and making viable low-carbon and low-impact industrial and industrial processes (OECD, 2009)[96]. The great transformation occurred when it became possible to read and copy the code of life - DNA -, and also to edit it (HARVARD BUSINESS REVIEW-BRASIL; CNI, 2013, p. 6). Today, techniques involving genetic biology are present in several domains, ranging from therapies and drugs to agricultural crops, animal feed, fuels, leather, vaccines, plastics and a variety of products. The language of the world, which had already migrated from analog to digital, now reaches the genetic code HARVARD BUSINESS REVIEW-BRASIL; CNI, 2013, p. 8). Thus, a new paradigm for sustainable development emerges, based on the bioeconomy. The application of this new paradigm to the Amazon, combining knowledge of the region's biodiversity with the possibilities of Industry 4.0, has been defended by the acclaimed Brazilian climatologist Carlos Nobre, in publications in Brazil and abroad, as well as in a presentation at the World Economic Forum in 2020, in Davos. The following paragraph summarizes some of his ideas.

After the relative containment of deforestation, notably between 2004 and 2012, a window of opportunity was opened to structure a "third way" of development for the Amazon, between the two extremes represented by keeping the forest untouched or continuing to cut it down. It is about the bioeconomy of the forest, which consists of using the knowledge provided by science, technology, innovation and strategic planning for the development of new pharmaceutical products, cosmetics and food, as well as for the research of new materials

[96] "*From a broad economic perspective, bioeconomy refers to the set of economic activities related to the invention, development, production and use of biological products and processes*" ("From a broad economic perspective, the bioeconomy refers to the set of economic activities relating to the invention, development, production and use of biological products and processes "). (OECD, 2009)

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and energy solutions. Example: Amazonian plants contain biochemical secrets, such as new molecules, enzymes, antibiotics and natural fungicides, which can be synthesized in the laboratory and result in value-added products[97]. There are also examples of typical fruits, among which stand out açaí and cupuaçu (NOBRE; NOBRE, 2019, pp. 8-13, 15; NOBRE et al, 2016, pp. 10759-10760, 10764-10765). Both have already been the subject of undue attempts to appropriate their names and uses[98]. In fact, açaí has become an important item on the Brazilian export basket, the production of which benefits more than 300 thousand farmers and generates, annually, more than 1 billion dollars for the region's economy. It is in this context that the concept of *Amazon* 4.0 is conceived, which aims to add to the potentialities of Amazonian socio-biodiversity - fauna, flora and traditional knowledge - the new technologies and possibilities of the fourth industrial revolution. The idea is to transform natural resources into products with higher added value, generated and consumed in a sustainable way. This entire process must be justly concerned with bringing substantial benefits to local communities (NOBRE; NOBRE, 2019, p. 8-13, 15; NOBRE et al, 2016, pp. 10759-10760, 10764-10765).

As intuitive, everything that has been exposed so far involves education, science, technology and attraction of human resources to the region, coming from other parts of Brazil and also from major international centers. People who can join the long-standing efforts of private and public institutions such as INPA - National Institute for Research in the Amazon, ISA - Socioenvironmental Institute, INPE - National Institute for Space Research, IMAZON - Institute of Man and the Environment of the Amazon and CENSIPAN - Management and Operational Center for the Amazon Protection System and many others. It is precisely this local limitation for the generation of knowledge, due to the low investment and the consequent reduced number of research centers and researchers, that makes it difficult to explore the

[97] In the same sense, Thomas Lovejoy: "*All the species of this incredibly biodiverse system represent solutions to a set of biological challenges - each one with a transformational potential and that can generate benefits for all of humanity*". ("Every species in this incredibly biodiverse system represents solutions to a set of biological challenges - any one of which has transformative potential and could generate global human benefits"). (WORLD BANK, 2019).

[98] As previously mentioned, in addition to the case of açaí, cupuaçu also had its name and use registered in trademarks and patents in Japan, the United States and the European Union. Subsequently, these records were discontinued. V. Nogueira; Soares, 2010, p. 7.

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potentialities described here[99]. Always remembering that we live in a world in which knowledge, information and technology are the main assets. The great goal, therefore, must be to produce cutting-edge and transversal knowledge, in areas such as digital technology, biological sciences, genetic studies, development of raw materials and others. Government funding, start ups, new research centers, public-private partnerships, social and private entrepreneurs, investors and companies may contribute to something similar to what happened in Silicon Valley, California. State-of-the-art science to face big problems (NOBRE et al, 2016, p. 10765)[100]. Does it seem too ambitious? But, after all, if the Amazon is vital for humanity, why settle down to a low level? In this regard, a document released at the end of 2019 by a group of Brazilian and foreign scientists included among its proposals the establishment of a Scientific Panel for the Amazon - PCA (Science Panel for the Amazon - SPA), composed of researchers from the public sector and academia, Amazonian countries and the rest of the world. According to the document, the panel should also have the participation of representatives of local cultures, holders of traditional knowledge of the forest (SCIENTISTS OF THE AMAZON COUNTRIES AND GLOBAL PARTNERS, 2019, p. 11).

In short: the greatest protection against the destruction of the forest is that there is greater economic rationality in preserving it than in destroying it, either because its preservation generates income for the population, or because it generates substantial economic results that the country does not it can do without, or even because it generates biotechnological advances that benefit all of humanity. When this goal is reached, the forest will be safer. If this objective is not achieved, there will be no repressive apparatus capable of containing its destruction.

III. INTERNATIONAL PARTICIPATION

[99] "[W]ould remind you, first of all, that the Amazon contributes approximately 8% of the Brazilian GDP, but receives only 2% of the investments in science and technology of the total applied in the country" (VAL, 2010, p. 32).

[100] "It has become vital and indeed urgent to instigate a real scientific revolution, high technology and innovation in the Amazon". ("*It has become vital and indeed urgent to instigate a real scientific, high-tech, and innovation revolution in the Amazon*") (NOBRE et al, 2016, p. 10765).

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International participation can also be an important factor in curbing deforestation and the sustainability of the Amazon economy. First, today's developed countries must recognize their historic responsibility for destroying their own forests, as well as their significant contribution to climate change. Therefore, it is fair that they collaborate with developing countries so that they do not follow the same path, by financing programs and projects that reduce the emission of greenhouse gases, as well as providing the necessary technical assistance. Second, it is a fact that much of the agricultural, livestock, timber and mineral production in the Amazon is destined for the international consumer market. Therefore, this market can influence the behavior of domestic producers, requiring sustainable production practices. Finally, thirdly, the international financial market can collaborate, incorporating the environmental logic in its risk and feasibility analyzes in relation to projects that seek financing or placing shares on the market. The next step is to examine these three possible aspects of the international market's participation in the fight against deforestation.

1. Financing and technical assistance to reduce deforestation: CDM and REDD +

Two initiatives stand out with regard to financing and technical assistance to emerging countries to promote sustainable development. The first is the Clean Development Mechanism (CDM), which dates back to the Framework Convention and the Kyoto Protocol. Under this instrument, it was anticipated that developed countries would provide assistance for emissions reduction projects in developing countries. It was established that these projects would generate certified emission reductions (CERs), which could be negotiated in the global market, in order to raise funds for environmental preservation. The CDM was expected to be applicable until 2020. It was, however, the target of several criticisms, including its impropriety to effectively achieve effective environmental impacts, since developed countries used them precisely to continue emitting gases above the limit (NARAIN; VAN ' T VELD, 2008; SUBBARAO; LLOYD, 2011, p. 1600; MICHAELOWA; JOTZO, 2001, p. 511).

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The second initiative, which seems destined to replace the CDM, is the system of Reducing Emissions from Deforestation and Environmental Degradation (REDD +)[101]. It is a mechanism aimed at training and financing deforestation reduction or forest restoration projects in developing countries, through which it is expected to pay compensation to these countries for their performance in achieving these objectives[102]. This instrument was incorporated into the Paris Agreement, whereby developed countries were asked to contribute, together, 100 billion dollars a year to finance REDD + actions, in order to help emerging countries to achieve their emission reduction goals. greenhouse gas emissions (UN, 2015). At the international level, two important REDD + financing initiatives were funds launched by the World Bank (World Bank Forest Carbon Partnership Facility - FCPF) and the UN-REDD Program, a joint project between the United Nations and the Food and Agriculture Organization (RECIO , 2019, p.132). Some developed countries have also launched bilateral programs to support REDD +, such as Norway and Germany. However, funding for REDD + actions available today is insufficient for reduction actions (RECIO, 2019, p.132): state resources in limited amounts predominate and there is talk of the need to create incentives for the private market to also contribute with resources (VIANA, 2009).

In 2008, Brazil created the Amazon Fund[103], aimed at financing REDD + actions, which, by the end of 2018, had received approximately R $ 3.4 billion in donations[104]. This amount consists of 93.8% of resources from the government of Norway, 5.7% from the government of Germany and 0.5% from Petróleo Brasileiro S / A - Petrobrás (BNDES, 2019, p. 27-31). In 2009,

[101] There is a central element that differentiates REDD + from CDM. Under the Paris Agreement, all countries have their own goal of reducing global emissions to be achieved; whereas, in the Kyoto Protocol system, developed countries had a predefined target and sought carbon credits in developing countries in order to make it more flexible. (GREINER et al, Jun. 2019).

[102] REDD was originally a mechanism designed to reduce deforestation and forest degradation (REDD). Later, its scope included sustainable forest management, conservation and increased forest carbon stocks (REDD +).

[103] Decree no. 6,527 / 2008. The Fund aims to finance actions to prevent, monitor and combat deforestation and to promote the conservation and sustainable use of the Legal Amazon.

[104] In 2009, it also created the National Fund on Climate Change (Law 12,114 / 2009), of an accounting nature, linked to the Ministry of the Environment, aimed at financing projects, studies or undertakings aimed at mitigating climate change and adaptation to climate change and its effects. Other financing instruments are the National Environment Fund (Law No. 7,797 / 1989), the National Forest Development Fund (Law No. 11,284 / 2006) and the Protected Areas Fund of the Amazon Protected Areas Program.

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the country approved its already mentioned National Policy on Climate Change (PNMC)[105]. In 2010, it also assumed a commitment to an 80% reduction in deforestation rates in the Legal Amazon, in relation to the average verified between 1996 and 2005[106]. In 2015, it established its National Strategy for REDD + (ENREDD +) (MMA, 2016a) and created the National Commission for REDD + (CONAREDD +)[107]. As a result, the Amazon Fund became eligible for access to payments for REDD + results achieved by Brazil and recognized by the UNFCCC. The country's history was, therefore, a successful one in raising funds and building credibility in terms of its management and use capacity. However, the great increase in deforestation in the Amazon region in 2019, the fires and disagreements with the federal government led to the suspension of transfers of values by the referred countries (NEGRÃO, 2019; BARBOSA, 2019).

2. Demand from consumer markets: products not associated with deforestation

A second important contribution to the preservation of the Amazon may come from consumer markets for Brazilian exports. As already mentioned, a very significant portion of the country's agricultural and livestock production is destined for the international market, with a relevant impact on GDP. Given this reality, restrictions by foreign consumers on products associated with deforestation can be effective in discouraging environmentally harmful behavior. And, in fact, a very successful experiment, known as the *Soy Moratorium*, proves the point. In 2006, Greenpeace promoted a campaign denouncing nominally companies in the soy industry - responsible for technical assistance, financing and purchase of production - as accomplices in deforestation in the Amazon (GREENPEACE INTERNATIONAL, 2006). Thereafter, negotiations began that resulted in a pact between agribusiness entities, environmental NGOs and the Government itself for the non-acquisition of soy from deforested areas after July 2006. The large companies in the industry gave in to the risk reputational damage to a consumer market that is increasingly aware of environmental issues. Studies show the sharp drop in deforestation related to the production of this *commodity* (GIBBS et al, 2015, p. 377).

[105] Law no. 12,187 / 2009.
[106] Decree no. 7,390 / 2010, art. 6, § 1, I. Currently, the provision is contained in Decree no. 9,578 / 2018, art. 19, §1º, inc. I, who consolidated the normative acts regarding the National Fund on Climate Change.
[107] Decree no. 8,576 / 2015 (replaced by Decree No. 10,144 / 2019, currently in force).

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The initiative also served as a model for entering into a similar agreement with large Brazilian beef producing and exporting companies a few years later. This second agreement, signed with Greenpeace, became known as G4 *Zero Cattle Aggrement*. Through it, these companies committed to zero deforestation in their supply chain[108]. A study on the impact of the agreement on livestock activity found that it effectively led to a reduction in deforestation by the direct suppliers of these companies (GIBBS et al, 2016, pp. 32-42). Both initiatives demonstrate that the consumer market for a product can interfere with its production model and establish incentives for it to become environmentally responsible[109]. However, it is not enough that only direct suppliers are monitored. It is necessary to control the entire production chain, to prevent suppliers involved in deforestation from selling to those who are regular, "washing" the contaminated product. Failure to monitor indirect suppliers can produce a mere appearance of engagement in combating deforestation (FEBRABAN; FGV EAESP, 2018, pp. 32-36). One of the instruments commonly used in such monitoring is certification (NEPSTAD; STICKLER; ALMEIDA, 2006, p. 1600). In any case, the experiences described above demonstrate the effectiveness of control actions over the supply chain. Although there are international initiatives in this direction, it is necessary to reinforce them, impose the monitoring of indirect suppliers, make possible restrictions on products compromised with deforestation credible and sanction irregular suppliers[110].

3. Criteria for financial institutions: deforestation as a factor of depreciation and risk

The same logic is applicable to the financial market. Financial actors can contribute to reinforce the currently predatory model of production, if they behave indifferently on the

[108] The initiative was preceded by criminal actions initiated by the Federal Public Ministry against ranchers and slaughterhouses involved in deforestation. Such processes and the repercussion of the fact led to the execution of Terms of Conduct Adjustment by the slaughterhouses, through which they undertook to monitor their supply chain and not to buy meat from those involved in deforestation. V. NWF; GLUE, s / d.

[109] In the same sense, Nepstad et. al, 2014; Brannstrom et al, 2012.

[110] For illustrative purposes, for international initiatives in this regard, see shares of the Consumer Goods Forum (CGF), Tropical Forest Aliance (TFA), as well as the NY Declaration on Forests and the Amsterdam Declaration Partnership. V. NWF; GLUE, s / d.

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environmental issue, or they can be agents of a major paradigm shift. Agribusiness depends on resources to finance its production. These resources can be raised in many ways: through financing, sale of equity interests, going public or other instruments. Financial institutions influence investment decisions and business models, whether or not they take environmental criteria into account in their decisions (FICHTNER; HEEMSKERK; GARCIA-BERNARDO, 2017). In this sense, it is worth pointing out that there is a growing understanding that financial investments can be adversely affected by environmental problems or by reputational damage resulting from companies involved in deforestation (GALAZ et. Al, 2015). Just consider, for example, the possibility of restriction to the relevant products by the respective consumer markets, discussed in the previous item. It is also considered the alternative of holding financial institutions responsible for sponsoring illegal activities (SCHOLTENS, 2017).

Some financial institutions have already started to adopt environmental risk analysis in their investments. This is the case of the Bank of Norway, which excluded from its portfolio companies that did not comply with certain environmental standards (GALAZ et. Al, 2015). In the same vein, the International Finance Corporation, the financial arm of the World Bank, included the environmental aspect in its performance measurement criteria (GALAZ et. Al, 2015). Nor is this type of concern foreign to Brazilian financial institutions. In fact, there are parameters for verifying environmental regularity for agricultural financing purposes and specific requirements for companies that are part of the Amazon biome (FEBRABAN; FGV EAESP, 2018, pp. 52-67). Here, too, the examination of financial actors should not be limited to the financed company or its direct suppliers. They need to take into account the entire production chain, also consider indirect suppliers and establish standards of conformity and good practices, which, if not met, give rise to the rejection of financing or the application of penalties.

Even the most resistant producers to the environmental issue respond to economic incentives. If the environmental regularity of your entire chain becomes a condition without which you will not be able to finance your activity, the tendency is that they will adjust their behavior to this new reality. Therefore, a third possibility of international participation in the

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fight against deforestation in the Amazon is the establishment of global standards of environmental performance to be taken into account by financial institutions for the evaluation of the IPO, the acquisition of equity participation, the financing or any another business that involves agents that have, in their supply chain, companies active in the Amazon biome. Although the standards are not mandatory, their recognition as good practices and the adhesion of institutions can create important reputational incentives and contribute to the construction of a new environmental paradigm[111].

CONCLUSION

Climate change, global warming and the extinction of species are threatening challenges of our time, with serious implications for the future of humanity. The Amazon plays a critical role in tackling these problems and in the ecological balance of the planet, due to its extraordinary biodiversity, its role in the water cycle and the rain regime, as well as its carbon storage capacity, which is of great importance for the mitigation of global warming. Its preservation is of vital importance for Brazil and the world.

The Brazilian Amazon, which corresponds to 60% of its total extension, reached the peak of deforestation and degradation in 2004, the year in which the destruction of the forest reached 27,772 km2. From then on, however, a new awareness on the matter developed, which led to an extraordinary progressive fall in deforestation, which in 2014 was reduced to 5,012 km2. The ultimate goal should be zero net deforestation. However, after 2015, the destruction numbers rose again, reaching almost 10,000 km2, mainly due to the cooling of the government's impetus to monitor, inspect and suppress illegal activities involving the forest. The main environmental crimes committed in the Amazon are deforestation, fires, illegal logging and illegal mining. Land grabbing of public lands is also a serious problem.

[111] Financial institutions can also encourage adherence to green bonds, financing instruments for projects that generate environmental benefits and / or that support sustainable activities. V. OECD, 2017.

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The occupation of the Amazon Forest, from the early 1970s to the present, took place in two opposing and exclusive ways: on the one hand, economic activities such as agriculture, livestock and mining, combined with large infrastructure projects, in a vision that associated development with deforestation; and, on the other hand, the untouched preservation of most of the forest, through the creation of conservation units and the demarcation of indigenous lands, areas where any economic activities were prohibited or highly regulated. Neither model was able to extract the best economic, social and environmental potential from the forest: the first, because it was based on a logging logic, and the second, because it was unable to contain the expansion of deforestation borders.

The forest bioeconomy, an economic model that prioritizes sustainability, has been conceived as a new paradigm for the economic and social development of the Amazon, due to its low environmental impact. The bioeconomy is based on innovations in the field of technology and biological sciences, combining the region's biodiversity, traditional knowledge and the so-called Industry 4.0, the result of the fourth industrial revolution. This opens up a wide field for new pharmaceutical, cosmetic and food products, as well as for the search for new materials and energy solutions. This new model requires substantial investments in research, science and technology, attraction of excellent human resources, from Brazil and abroad, and efficient mechanisms of financing and incentives, with public and private partnerships. An important stimulus to this new perspective will be the attitude and demand of consumer and financing markets regarding the environmental sustainability of the products they will consume and finance, which would also impact the cattle, soy and wood industry in the region, avoiding new deforestation and encouraging adequate forest management.

There is an economic and social logic in the devastation of the forest. It is a perverse but powerful logic. For it to be defeated, a consistent alternative model is needed, capable of bringing sustainable development, human security and citizenship support. Ignorance, necessity and state omission are the enemies of the Amazon. Science, social inclusion and the awareness of society will be your salvation.

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