

MITIGAÇÃO E ADAPTAÇÃO DAS CIDADES ÀS ALTERAÇÕES CLIMÁTICAS: VULNERABILIDADES SOCIOAMBIENTAIS E CONFLITOS JURÍDICOS NA TUTELA DAS ÁREAS DE PRESERVAÇÃO PERMANENTE URBANAS NO BRASIL**MITIGATION AND ADAPTATION OF CITIES TO CLIMATE CHANGE: SOCIO-ENVIRONMENTAL VULNERABILITIES AND LEGAL CONFLICTS IN THE PROTECTION OF URBAN PERMANENT PRESERVATION AREAS IN BRAZIL****Nelson Novaes Pedroso Junior¹**
André de Castro dos Santos²**ABSTRACT**

This paper aims to understand the relationships between socio-environmental vulnerability in Brazilian urban areas in the current context of climate change and the legal protection of urban Areas of Permanent Preservation (APP, in the acronym in Portuguese). We seek to identify and interpret how the composition formed by (i) norms currently in force in Brazilian law, (ii) instruments of environmental and land-use planning public policies, and (iii) jurisprudence on normative conflicts related to the discipline of urban PPAs. By means of a literature review and critical analysis of the legislation, other public policy instruments and jurisprudential precedents, we aimed to understand how this composition is aligned with initiatives to mitigate and adapt to climate change and to reduce socio-environmental vulnerabilities resulted from or aggravated by it, with a focus on the situation of populations that live precariously in risk

areas. As a result, we have identified a complex and not very harmonious composition of norms applicable to these protected areas in the urban context. However, the current understanding of jurisprudence and the current legislative activity have evolved positively in relation to the necessary actions of adaptation to climate change and reduction of socio-environmental vulnerabilities, although important improvements are still necessary for effective protection and restoration, whenever possible, of urban APP.

Keywords: Urban Permanent Preservation Areas; Urban environment; Environmental law; Urban law; Urban land use planning.

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RESUMO

Este artigo tem como objetivo compreender as relações entre vulnerabilidade socioambiental nas áreas urbanas brasileiras no contexto atual de mudança do clima e a proteção jurídica das Áreas de Preservação Permanente (APP) urbanas. Buscamos identificar e interpretar como se dá a composição formada (i) por normas atualmente vigentes no direito brasileiro, (ii) por instrumentos de políticas públicas ambientais e de ordenamento do território e (iii) pela jurisprudência sobre conflitos normativos relacionados com a disciplina das APP urbanas. Por meio de revisão de literatura e da análise crítica da legislação, de outros instrumentos de políticas públicas e de precedentes jurisprudenciais, objetivamos perceber de que maneira essa composição se alinha com iniciativas voltadas à mitigação e à adaptação às mudanças climáticas, bem como à redução das vulnerabilidades socioambientais delas decorrentes ou por elas agravadas, com foco na situação de populações que residem precariamente em áreas de risco. Como resultado, identificamos uma composição complexa e pouco harmoniosa de normas aplicáveis a estas áreas protegidas no contexto urbano. Contudo, o atual entendimento da jurisprudência e a recente atividade legislativa têm evoluído positivamente em relação às necessárias ações de adaptação às alterações climáticas e redução das vulnerabilidades socioambientais, embora importantes aprimoramentos sejam ainda necessários para efetiva proteção e recomposição, quando possível, das APP urbanas.

Palavras-chave: Áreas de Preservação Permanente urbanas; Meio ambiente urbano; Direito ambiental; Direito urbanístico; Ordenamento do território urbano.

Introduction

In Brazil, the second half of the 20th century was marked by accelerated processes of urbanization and rural exodus resulting, among other factors, from the growth of the industrial and service sectors in the cities and metropolitan regions, as well as from the mechanization and intensification of agricultural production and the concentration of land in the countryside (SANTOS, 1993). In general, the growth of Brazilian cities took place through the disorderly occupation of urban space, a result of the lack of territorial planning and the historical contexts of socio-economic inequality in the country. Urbanization, as it happened historically in Brazil, has generated serious urban crisis, especially in medium and large cities, marked by socio-spatial segregation, high housing deficit, environmental degradation and accentuated informal access to urban land (ROSIN; TEIXEIRA, 2013).

The disorderly occupation of Brazilian cities was partly consolidated over areas of greater environmental fragility, such as floodplains in the interior and beaches and *restingas* in coastal regions, with peripheral expansion to hill slopes, mangroves and wetlands. This process has been characterized by

deforestation, canalization of waterways, soil sealing, landfills and drainage of natural areas, which increased the fragility of these spaces, now anthropized, and their conditions of socio-environmental vulnerability.

With the increase of urban peripheries, the poorest and most vulnerable portions of the population have occupied environmentally more fragile areas, exposing them unevenly to greater risk of impacts caused by disasters and expanding the conditions of socio-environmental vulnerability. In this sense, socio-environmental vulnerability can be defined as the coexistence, cumulativeness, or spatial overlap of situations of poverty and social deprivation and situations of exposure to risk, often associated with environmental degradation (ALVES, 2009). With the increased occurrence and intensity of extreme weather events, the conditions of socio-environmental vulnerability in cities have worsened. Thus, the planning and implementation of actions aimed at the mitigation and adaptation³ to climate change in cities is of utmost importance.

One of the viable strategies to mitigate and adapt to climate change in cities is the regulation of the forms of protection of natural areas in accordance with the urban norms of use and occupation of the territory. In Brazil, one of the main environmental protection mechanisms applicable to urban spaces are the Permanent Preservation Areas ("APP", in the acronym in Portuguese), provided by Federal Law No. 12.651/2012, which establishes the Protection of Native Vegetation ("LPVN", in the acronym in Portuguese) - also known as the "new Forest Code"⁴. APPs are legally protected territorial spaces, environmentally fragile and vulnerable, and may be public or private, urban or rural, covered or not by native vegetation. In urban areas, the APPs are those of greater environmental fragility and which have had significant parts occupied in a disorganized way, as mentioned before, especially on the margins of water courses and slopes. Many of the occupations in urban APPs were carried out by poorer human populations and in more severe conditions of socio-environmental vulnerability, exposed unequally to risks arising from disorderly occupation and climate events intensified increasingly by climate change. In this context, an imminent conflict has been established between constitutionally protected goods in Brazil: the right to housing and the right to a healthy and ecologically balanced environment (DE MARTINO; FREITAS, 2018). This conflict is mainly due to the historical inefficiency of the State in reserving natural areas for ecosystem conservation while offering possibilities of decent housing that meets basic

³ Adaptation to climate change, as defined by the IPCC (2012, p. 3): "In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate."

⁴ The term "new" refers to the fact that this Law revoked Federal Law 4.711/1965, known as the Forest Code, at the time it came into effect.

functions for survival (OLIVEIRA et al, 2018), through housing policies and effective instruments of land regularization (DE MARTINO & FREITAS, 2018).

In addition to these occupations, the disorder characteristic of the urbanisation process has also led to the construction of middle and upper-class housing developments, as well as public and private buildings, streets, avenues and other urban infrastructure on riverbanks and other places characterized as APPs. Although these occupations tend to be more consolidated, with more urban infrastructure equipment implemented, they have also been subject to greater vulnerability with the advent of climate change. In the case of hydric APPs, this is particularly relevant, since urbanization in these areas is characterized by difficult reversibility, requiring singular attention to the environmental debate in cities and proposing a radical review of the way they relate to their waterways (ANELLI, 2015).

There is, therefore, a gap between the provisions of the law and the reality of Brazilian cities, since riverbanks, especially in medium and large cities, are, in general, widely occupied and urbanized and the solutions for land regularization and urban renewal have been approved ignoring the untouchability of the APPs, in disregard of the protection provided in federal legislation (CASTRO et al, 2018). In many cases, urban occupations over APPs have a practically irreversible character, a fact that gives rise to the need to foster an appropriate and urgent environmental and urban debate in cities, as well as the review of the ways in which they relate to these areas and the rules that seek the compatibilization of uses.

Given the challenges presented, in this paper we intend to analyze the relationship between socio-environmental vulnerability in Brazilian urban areas in the current context of climate change and the legal protection of urban APPs. More specifically, we aim to understand how the composition formed by the rules currently in force and by environmental and land use planning public policy instruments related to the discipline of urban APPs, as well as by the jurisprudence on conflicts arising from this composition takes place. Based on this, through a literature review and critical analysis of the legislation, other public policy instruments and jurisprudential precedents, we aim to understand how this composition is aligned with initiatives to mitigate and adapt to climate change and reduce socio-environmental vulnerabilities arising from or aggravated by climate change, with emphasis on the situation of populations living precariously in risk areas.

1. Climate change and urban space

The main Brazilian urban centres, especially those located in the Southeast Region, grew in a fast and disorganized way throughout history, especially from the second half of the 20th century (SANTOS, 1993). Pressured by the reduction of jobs in the countryside and by the development of the industrial sector in urban areas, the cities were subject to massive immigration. However, the urban centres were not prepared to receive, in such a short period, an extremely relevant number of migrants.

In this context, the lack of efficient housing policies and the permissiveness of real estate speculation, which have historically marked the development of Brazilian cities, have forced the occupation of hillside and floodplain areas and areas on the banks of water bodies. This process of transforming vast portions of rural environments into urban areas has served the interests of the market, which sees in urban land possibilities for profit and capital appreciation. As a consequence, Brazilian cities have been subject to profound spatial segregation, resulting from this explosive model of income concentration (RIBEIRO, 2008). In the same sense, Rolnik (1999, p. 100) explains:

The hills and the asphalt in the south zone of Rio de Janeiro, the center and the peripheries of the metropolis of São Paulo, the mangrove and the waterfront in the seaside city are territorially distinct translations of the inequality of urban opportunities that defines our cities. (...) In the peripheries (or favelas, squatter settlements, invasions), urbanism is eternally incomplete and, more often than not, risky. Urbanism at risk is that marked by insecurity, whether of the land, the construction, or even the legal condition of possession of that territory. The land on which these housing markets for the poor are developed is usually that which, due to its environmental characteristics, is the most fragile, dangerous, and difficult to occupy with urbanization: steep slopes, riverbanks, flooded areas (our translation).

The irregular and disorderly occupation of risk and environmentally fragile areas is related in part to greater socio-environmental vulnerability conditions. These areas are already naturally subject to soil movement and flooding, but the concept of socio-environmental vulnerability goes beyond the environmental aspects and incorporates exposure to risk, susceptibility to risk and adaptive capacity (or resilience) of people facing the materialization of risk (ALVES, 2014).

In Brazil, the occupation of risk areas is a recurrent aspect in urban and peripheral areas of cities. Among them, Salvador, São Paulo and Rio de Janeiro stand out. According to data from the Brazilian Institute of Geography and Statistics (IBGE), the capital of Bahia has more than 1.2 million people inhabiting risk areas, which represents 45.5% of its total population; in the capital of São Paulo, approximately 700,000 people, representing 6% of its total population, inhabit wealthy areas, while in the

capital of Rio de Janeiro there are approximately 450,000 people, representing 7% of its inhabitants (IBGE, 2018).

Populations in risk areas are more likely to suffer from floods, landslides and fires caused by heavy rainfall or long periods of drought. In recent decades, the risk of disasters and severe impacts in these areas has significantly increased as a result of climate change, responsible for the increased frequency and intensity of extreme weather events (IPCC, 2012).

With the advent of climate change, cities need to deal with issues such as the potentializing of heat islands, sea level rise, the occurrence of urban pests, heavy rains and prolonged periods of drought (RIBEIRO, 2008). Consequently, there has been an increase in the frequency and intensity of floods, landslides and tidal surges affecting urban areas and causing deaths, loss of property and materials, compromising the water and food supply, among other impacts (ICLEI, 2016). We also emphasize that the impacts caused by climate change vary according to the socio-environmental vulnerability of urban populations, tending to be more severe in poor residents of risk areas and environmentally more fragile. Thus, mitigation and adaptation measures to climate change in these areas are especially urgent.

Thus, the adaptation of the Brazilian territory to climate change is a reality that imposes itself to political decision makers. The choice to adopt adaptation policies must be based on a balance between the costs related to action or abstention from adaptation. Based on the assumption that it is impossible to neutralize all impacts related to climate change, decision-makers should consider the costs associated with the implementation of adaptive measures together with the residual impacts that cannot be eliminated. Thus, adaptation policies should aim at minimizing as much as possible the costs -economic, social, cultural and environmental- in comparison with the scenario in which no adaptation action is undertaken. Therefore, in order to effectively adapt to climate change, cities must be subject to a combination of policy interventions in areas such as environment, housing, civil defence, basic sanitation, water resources management and urban mobility; in short, in all areas related to urban spatial planning.

In this sense, territorial planning policies combined with clear and effective environmental regulations are relevant measures to mitigate the impacts of climate change and address the causes of irregular occupation of risk and environmentally more fragile areas (ARAÚJO; GANEM, 2016). However, remedying the environmental liabilities of these areas with consolidated occupation, especially by poor and vulnerable populations, is a major challenge, mainly because of the possibility of remedies being applied disproportionately on this portion of the population and thus worsen the vulnerability of people who are already victims of a historical process of exclusion and socioeconomic inequality.

The scenario presented shows that a significant portion of the Brazilian urban population lives in areas of risk and greater environmental fragility, in a context in which the number of environmental

disasters has grown significantly in the country (UFSC, 2013). It is therefore urgent that public policies and legal norms have as their object the effective discipline of protection of these areas. In cities, a significant part of these spaces is located in APPs, occupied or not, which reinforces the importance of regulating their protection and recovery as a way of mitigating and adapting cities to climate change, also taking into consideration the local socio-environmental vulnerabilities typical of Brazilian cities.

2. Urban APPs as protected areas: compositions and conflicts between norms

Brazil has different instruments in its domestic law designed to protect the environment, among which we highlight the creation of protected areas⁵. As provided in the Federal Constitution of 1988, in Article 225, III, § 1º, it is the duty of the Public Power

define, in all the Units of the Federation, territorial spaces and their components to be specially protected, with alteration and suppression being permitted only by law, and with any use that compromises the integrity of the attributes that justify their protection being (our translation).

Thus, when dealing with protected areas, the constitutional text uses a sufficiently generic term to cover all terrestrial, marine, or aquatic ecosystems in the national territory, which are not limited to forests (NUSDEO, 2018). We also emphasize the determination that the protection of these spaces can only be changed by force of law, being forbidden to change by infra-legal rules. Therefore, the Constitution restricted the possibilities of alteration and suppression of protected areas to rules of parliamentary origin, so as to expand the opportunities for social reaction and organization against possible setbacks in environmental protection (MACHADO, 2012).

The protection conferred by the Federal Constitution unfolds in a variety of regimes, in such a way that current Brazilian law recognises, in different norms, the special legal protection of protected areas. And this is not a new fact. Throughout history, since the colonial period, successive norms have been created in Brazil with the aim of protecting the environment, by different means and supported by different objectives.

To meet the objective proposed in this paper, we will highlight the LPVN, a norm applicable in public and private, rural and urban properties. The creation of protected areas under the LPVN is done through the institution of APPs and Legal Reserves, institutes that already existed in the "old" Forest Code - Law 4.711/1965, revoked by the LPVN. Unlike Legal Reserves, restricted to rural properties, APPs are also applied to urban territories. In a nutshell, APPs are protected areas due to their specific and

⁵ Para o termo "área protegida", destacamos a definição de Trzyna (2017): "um espaço geográfico claramente definido, reconhecido com objetivo específico e gerido por meios eficazes, sejam jurídicos ou de outra natureza, para alcançar a conservação da natureza a longo prazo com serviços ecossistêmicos e valores culturais associados".

differentiated functions of preserving biodiversity, facilitating gene flows, recomposing subsoil water resources, protecting surface water bodies and reducing erosion, maintaining essential ecological functions for the preservation of water resources and geological stability and are determined according to their location or characteristics, i.e., they are considered existing as long as the occurrence of certain characteristics and factual situations provided for in the legislation is verified (MACHADO, 2012).

The current protection of APPs, as stated in the LPVN, is the result of a process of normative evolution that began in the first Brazilian Forest Code, established by Decree 23.793/1934. In this first norm, which aimed to protect forests, the legal institution of APP did not exist yet. This rule was replaced by the 1965 Forest Code, which also did not include this institute in its original text. In this norm, forests were protected from utilitarian objectives, aiming to ensure the water supply and avoid erosive processes (CASTRO et al, 2018). Protection close to the current APP was first instituted through Provisional Measure No. 2.166-67/2001, which amended the Forest Code then in force, expanding the idea of environmental protection to the maintenance of ecosystem services, such as the protection of biodiversity and gene flow. In 2012, with the advent of the LPVN, the protection of APPs was maintained, and has remained in force to this day.

In the case of urban APPs, it is worth mentioning among their various functions or ecosystem services: a) the protection of the soil, preventing the occurrence of disasters associated with the inappropriate use and occupation of slopes and hilltops; b) the protection of water bodies, avoiding floods, water pollution and silting of rivers; c) the maintenance of soil permeability and of the water regime, preventing floods and torrents, collaborating with the recharge of aquifers and avoiding the compromise of public water supply in quality and quantity; d) the ecological function of refuge for fauna and ecological corridors that facilitate the genetic flow of fauna and flora, especially between green areas located in the urban perimeter and its surroundings, and e) the mitigation of intra-urban climatic imbalances, such as excessive aridity, thermal and environmental discomfort and the "heat island" effect (CARMO, 2017).

It is also important to mention that, as a protected area and whose size has direct consequences on property rights, APPs are a matter reserved exclusively for the Legislative Branch, and the Executive Branch is forbidden to create or alter measures of these protected spaces in any way - decree, ordinance, normative instruction or resolution (MACHADO, 2012). Therefore, the APPs, whose definition and use limitations are provided in articles 4 to 6 of the LPVN, are areas whose protection is of immediate importance for mitigation and adaptation to climate change. The effectiveness of their protection, especially in urban areas, limits the occupation of risk areas and contributes to the formation and

protection of water resources - whose availability may become more limited in some regions due to climate change.

In practice, the provision of APPs in urban areas presents additional challenges in relation to the rural context. In cities, the protection of APPs is no longer a specific object of environmental policy, being shared by the protection resulting from urban land-use planning policies. The composition of the Brazilian federative pact, and the consequent division of legislative competence among the federated entities, is an aspect that has caused uncertainties in the protection of APPs in urban areas, which has required the participation of the Judiciary to resolve conflicts. In addition, other rules, among which we highlight those of urban land planning and land tenure regularization, have aspects which interfere or overlap with the environmental legislation protection of the urban APPs. In the following items we will address how other norms influence the effective protection of these protected spaces.

2.1. Division of competences to legislate on environmental matters and its impacts on the protection of urban APPs

Regarding environmental matters, the Federal Constitution, in its article 23, VI and VI, determined the common competence of all the federated entities to protect the environment, combat pollution and preserve the forests, fauna and flora.

Next, in its articles 24, VI and 30, I and II, it determined how this common competence is organised; respectively, the concurrent legislative competence in environmental matters between the Union and the States, and the competence of Municipalities to legislate on themes of local interest - among which is the environment - in order to supplement federal and state legislation where appropriate.

Thus, the legislative competence in environmental matters was organized in the constitutional text so that it was up to the Union to set the minimum levels of environmental protection, while the States and Municipalities were given the competence to establish "caps" of protection, taking into account regional and local interests; In this sense, it is a consensus in the reference literature that States and Municipalities can never legislate in a way that contradicts the provisions of federal law, offering less protection to the environment than the parameters set by the Union (ARAÚJO; GANEM, 2016; FIORILLO, 2013; MACHADO, 2012; MILARÉ, 2009).

Therefore, all federal entities have, to some extent, competence to establish norms in environmental matters. However, since the LPVN is a federal law, there is a relevant limitation to the States and Municipalities to propose norms that coincide with issues addressed by the national law, among which is the definition of APPs.

In this sense, we highlight that, as Azevedo and Oliveira (2014) point out, the text of Law 12.651/2012 initially approved by the Brazilian Federal Congress provided that in urban areas, the marginal strips of any natural watercourse delimiting the flood passage areas will have their width determined by municipal rules, through the respective Master Plans and Soil Use Laws, after hearing the State and Municipal Environmental Councils, and in the case of urban areas and metropolitan regions, the provisions of the respective Master Plans and Municipal Soil Use Laws would be observed; In other words, the intention of the National Congress was to delegate to the Municipalities the possibility of establishing differentiated APP ranges, which could be larger or smaller than the parameters established in the Federal Law. However, these provisions were vetoed by the President of the Republic. In other words, the expansion of the competence to alter the delimitation of urban APPs by the other federal entities was foreseen, but later formally vetoed by act of the Presidency.

Even though the Federal Constitution restricts the legislative role of these federal entities, it is common for States and Municipalities to establish environmental norms that regulate the precepts established by the Union, in order to contextualize and perfect them for their local realities; It is also common for state and municipal entities to create norms that simply reproduce the text of the federal rule in order to reinforce it; and there are also cases in which States and Municipalities create norms that alter what was determined by the Union - either increasing the standards of environmental protection or lowering them.

In light of this legislative activity, over the last decades the jurisprudence⁶ of the Brazilian courts has been consolidated in the sense of reinforcing the understanding that States and Municipalities can legislate on environmental issues that have been the object of Federal Law only in cases where they choose to contextualize and strengthen or increase minimum environmental protection parameters, any initiative that reduces them being prohibited.

We also emphasize that this understanding of Brazilian jurisprudence is in line with the constitutional guarantee of the prohibition of retrogression of environmental protection. It is an implicit constitutional principle arising from the principle of human dignity, the principle of maximum efficacy and effectiveness of the rules defining fundamental rights, the principle of legal certainty, among others; thus, this guarantee seeks to protect fundamental rights against the legislator's actions, both in the constitutional and infra-constitutional spheres, as well as against the actions of the public administration (SARLET; FENSTERSEIFER, 2012). In addition to its principiological elements, the prohibition of retrogression has legal foundations ensured by the clauses of progressivity and the duty of continuous

⁶ As examples, we cite: STF - RE-AgR 1.131.559 SP, Reporting: Gilmar Mendes, Second Panel, DJe 20/12/2019; STF - RE-AgR 977.615, Reporting: Min. Rosa Weber, First Panel, DJe 28/02/2018; TJSC - ADI: 8000030602017240000 Capital 8000030-60.2017.8.24.000, Rela-tora: Soraya Nunes Lins, DJe: 05/06/2019.

realization and protection of social rights in international treaties, such as the International Covenant on Economic, Social and Cultural Rights of 1966, the American Convention on Human Rights of 1969, and the American Convention on Human Rights in the Area of Economic, Social and Cultural Rights of 1988 (SARLET; FENSTERSEIFER, 2012).

2.2. Apparent conflict between the Native Vegetation Protection Law and the Urban Land Division Law for the discipline of urban APPs

The Superior Court of Justice (STJ) and the Federal Supreme Court (STF)⁷ have also resolved an apparent conflict discussed in the literature between the application of the LPVN and Law 6,766/1979 ("Urban Land Division Law" or "LPSU", in the Portuguese acronym), with respect to urban APPs. This false divergence between the norms stems from the fact that the LPSU determines a minimum distance of 15 metres for constructions on the banks of "running and sleeping waters" (our translation) (art. 4, III-A⁸), while the LPVN establishes that the "marginal strips of any natural perennial and intermittent watercourse, excluding the ephemeral ones, from the edge of the regular course" (our translation) are considered APPs, in widths that vary between 30 and 500 meters, depending on the width of the watercourse (art. 4, I and paragraphs); the areas around natural lakes and lagoons should be preserved in strips of 30 meters, in urban areas (art. 4, II, b).

Although the LPVN and LPSU overlap in the regulation of urban land use on the banks of water bodies, the norms have different biases and intentions in the protection of these spaces (Maciel, 2010). The LPSU does not aim to promote the protection of ecosystem services by establishing the *non-aedificandi* area, but rather the safety of the population, while the LPVN devices aim to protect living beings and ecosystem services in these spaces. Thus, it is possible that in a concrete case, both laws are applied concurrently; for example, even if the administrative authority grants permission for suppression of vegetation in an APP, in the exceptional cases provided for in the LPVN, the restriction imposed by the LPSU would remain valid (MACIEL, 2010). In other words, the suppression of the APP would be legally accepted, without the building in the construction area restricted by the LPSU.

Moreover, we highlight the fact that the LPVN literally refers to "any natural watercourse" (our translation), while the LPSU mentions "running and sleeping waters" (our translation). Based on this difference in terminology, the STJ recognized the differentiation in the application of the federal rules,

⁷ In this sense: STF - ADI No. 2903, Reporting Min Celso de Mello, Full Court, judgment on 01/12/2005; STF - RE: 1112903 SC, Reporting Min Luiz Fux, judgment date: 23/08/2019.

⁸ As inserted by Law No. 13,913/2019.

depending on whether the watercourses are natural or artificial, so that the LPVN applies to the former and the LPSU to the latter⁹.

In providing a further response to this controversy and apparent normative conflict, a decision of the Superior Court of Justice handed down in 2021 established the following thesis:

Under the new Forest Code (Law No. 12.651/2012), the extent of the Permanent Preservation Areas of any perennial or intermittent watercourse, in areas characterised as consolidated urban areas, which cannot be built upon, must comply with the provisions of Article 4, main section, clause I, paragraphs a, b, c, d and e, in order to ensure the broadest environmental guarantee for these specially protected areas and, consequently, for the community (our translation)¹⁰.

Thus, jurisprudence has firmed up the understanding that, even in consolidated urban areas, the delimitation of the LPVN must be interpreted with specific applicable law, in order to ensure the broadest environmental guarantee for these specially protected spaces in urban areas. The contents of this decision consolidate jurisprudence and bind all judges in the national territory, both in ongoing proceedings and in those filed in the future.

Despite the fact that this decision reinforces the constitutionally recognised principles of protection of the natural and artificial environment, of sustainable development and of the social and ecological functions of properties, the fact that this controversy has been defined within the scope of the Judiciary and not the Legislative Branch, confers legal uncertainty to the issue. This arises from the fact that, with this decision, developments and building works that have been regularly approved or licensed, in accordance with the due administrative process, based on the understanding that the applicable law would be the LPSU, are retroactively considered irregular.

In this sense, we argue that the ideal solution would be a clearer definition in the legislation about the scope of each of the federal laws and the temporal delimitation of its application, whether retroactive or applicable only in future situations.

2.3. Land-title regularisation of urban areas with consolidated occupation in APPs

Another important aspect to be considered for the protection of APPs in the urban context is related to the criteria considered for the recognition of the consolidation of occupation in these areas, which justify the maintenance of the environmental decharacterisation of the occupied APP instead of its recovery.

⁹ In the terms of that decision: in this manner, when dealing with natural watercourses, Law 12,651/2012 applies, and the marginal strip with a minimum width of thirty meters must be respected, and, in the case of artificial water bodies, the urbanistic distance determined by the Urban Land Division Law must be required, observing the distance of fifteen meters (our translation). (STJ - Special Appeal No. 1,658,486 - SC, Monocratic Decision: Min. Francisco Falcão, DJe/STJ 06/03/2018).

¹⁰ In this sense: STJ - Theme/Repetitive No. 1,010, Reporting Justice Benedito Gonçalves, First Section, judgment on 28/04/2021.

Articles 64 and 65 of the LPVN, as amended by Law No. 13,465/2017 (Land Regularisation Law), deal with the hypotheses of land regularisation of urban settlements inserted in APPs. Under Law No. 13,465/2017, urban land regularization, defined by the norm as "Reurb", "covers legal, urbanistic, environmental and social measures aimed at incorporating informal urban settlements into the urban territorial planning and the titling of its occupants" (our translation) (art. 9) and its objectives are to improve the urbanistic and environmental conditions in relation to the previous informal occupation, to increase access to urbanised land by the low income population, so as to prioritise the permanence of the occupants in the regularised informal urban settlements themselves, to guarantee the social right to decent housing and adequate living conditions, to prevent and discourage the formation of new informal urban settlements, among others set out in the clauses of its article 10.

The above law provides for two types of Reurb: of social interest (Reurb-S) and of specific interest (Reurb-E). The former refers to informal urban settlements occupied predominantly by the low-income population, as declared by an act of the municipal Executive Branch; while the latter deals with land regularisation applicable to informal urban settlements occupied by a population not qualified under the previous hypothesis. The Reurb may be requested by the Union, States, Municipalities and by the Federal District, or by their beneficiaries.

We also underline that, under the terms of the referred legislation, if an informal urban settlement is found to be totally or partially located in an APP or in a conservation unit for sustainable use or for the protection of springs, the procedure must be preceded by the preparation of technical studies to justify the environmental improvements in relation to the situation of previous informal occupation, including through environmental compensations, when applicable. These studies must consider aspects such as the physical-environmental, social, cultural, and economic characterization of the area; the evaluation of environmental risks; the identification of resources, environmental liabilities and fragilities, the proposition of interventions for the prevention and control of geo-technical and flood risks; among others set out in the clauses of articles 64 and 65 of the LPVN, which vary according to whether the intervention is a Reurb-S or an Reurb-E.

3. Urban APPs, risk areas and adaptation to climate change

The objectives and instruments set out in the LPVN, based on the changes brought about by the Land Regularisation Law, are in line with the objectives and principles established by the City Statute (Federal Law No. 10,257/2001), the National Policy for Protection and Civil Defence (Federal Law No.

12,608/2012) and the National Plan for Adaptation to Climate Change (PNA), published in 2016 by the Ministry of the Environment.

As for the instruments related to tackling climate change, the PNA establishes as a guideline for urban policies that urbanization projects for precarious settlements must meet all the basic needs diagnosed in the area, especially in relation to the elimination of risks and the adoption of measures for de-densification with occupation rearrangement (BRAZIL, 2016).

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Regarding the instruments to reduce the vulnerabilities of the population living in risk areas and disaster response, the National Policy for Protection and Civil Defense provides for articulated actions among the federated entities, prioritizing disaster prevention and reduction actions, with the watershed being the unit of analysis of these actions related to water bodies and having as a starting point the planning based on research and studies on risk areas and disaster incidence in the national territory.

We also highlight that in some cases, adaptation infrastructure works will not be enough to eliminate or mitigate the risk and vulnerabilities to which populations are exposed (ARAÚJO NETO et al, 2014). In addition, it is necessary to remember that PPAs play fundamental ecological functions in protecting water resources, especially springs and riverbanks, so that, more than protecting urban springs and APPs still intact to ensure water supply, it is also necessary to recover these already degraded areas (ARAÚJO; GANEM, 2016). In these cases, it is essential that an integrated policy of relocation of the removed population be implemented, seeking to maintain cultural, affective, and habitual links with the previous area (RIBEIRO, 2008); otherwise, the population will not settle effectively in the new area, returning clandestinely to the area from which it was removed. Therefore, if the housing policy is not properly integrated, neither the environmental nor the social problem will be solved.

Finally, we underline that, besides the effective protection of risk areas and APPs, cities can also face climate change through the creation and promotion of green urban infrastructure, such as afforestation, squares, gardens and urban parks. Considering these structures in urban planning, together with instruments that ensure the effectiveness of APP protection, are important tools to combat heat islands and maintain sufficient soil permeability, which directly impacts the replenishment of aquifers and flood mitigation. Moreover, urban spaces such as trees in the streets, public and private gardens, urban parks - preferably integrated with remaining vegetation areas, forming ecological corridors - provide vital ecosystem services essential for tackling climate change (GILL et al, 2007). It should also be considered

that, in addition to the technical aspects, the implementation of green infrastructure in cities increases health (AMATO-LOURENÇO et al, 2016), the sense of comfort and improves the psychological perception of urban inhabitants of the place where they live (LOBODA; ANGELIS, 2005).

Despite the recognized importance of urban green areas, the planning of these spaces, when public, starts from a residual allocation of resources, i.e., the yearnings for green spaces of public order are softened with resources left over from other activities, considered more priority (LOBO-DA; ANGELIS, 2005). Thus, these spaces are relegated by the budgetary and territorial planning, although they are the most pressured by urban expansion.

In view of the above, we observe that the adaptation of cities to climate change goes through the effectiveness of APP protection; but other important aspects, related especially to the right of populations settled in risk areas and the availability of infrastructure for adaptation - environmental and social - must be considered together, in order that the adaptive actions do not deepen the conditions of vulnerability and social inequality of which the populations settled in risk areas are victims.

Conclusion

As we have shown, the Brazilian territory is exposed to vulnerabilities that may be created or increased in the context of climate change. The way urbanisation has occurred in the main Brazilian cities exposes a significant portion of the population to risks that tend to intensify in the coming decades. The increase in disasters and deaths resulting from climate events indicates the emerging need for adaptation. Therefore, an efficient planning of the urban territory, which considers the use of green infrastructure, combined with the adequate discipline of APP, together with effective policies of re-urbanization of precarious human settlements is an adequate path in favour of adaptation to climate change.

Brazil has a complex composition of regulations in force at different federal levels to protect APPs, which, in the urban context, commonly coincide with areas whose occupation risk tends to worsen in the context of climate change.

However, we observe immense difficulty in territorializing the public policy of environmental protection that is intended to implement through the institute of APPs in urban areas. As we have shown, the use and protection of these spaces are governed by rules of different subjects (environmental and urbanistic), instituted by the three federative entities (Union, States and Municipalities). There is, therefore, a series of norms that deal with the subject, without there being a clear organization and governance on the subject.

In practice, the organization of this series of norms on the theme derives, therefore, from the interpretation of the distribution of competencies among the federative entities determined in the Federal Constitution. However, there are cases in which States and Municipalities extrapolate their legislative competence, stipulating less restrictive rules of APP protection in relation to what is stated in the LPVN. Furthermore, it is not uncommon for municipal and state authorities to allow illegal interventions in urban APPs, based on a mistaken - or ill-intentioned - interpretation of the LPSU. In these cases, the Judiciary Branch has been called upon to solve these conflicts and has ruled accordingly, in line with the understanding of the literature. The recent decision of the STJ on Repetitive Theme 1,010 consolidated the jurisprudential understanding that the parameters of the LPVN must be applied in urban APP areas, ruling out application of the LPSU. However, the decision created legal insecurity by retroactively rendering irregular businesses and constructions licensed on the basis of the LPSU. This reinforces the importance of readjusting the legal text on urban APPs so that these spaces are duly protected by a specific instrument and not by a composition of conflicting laws.

The jurisprudential interpretation has also been in accordance with parameters established by national policies and instruments aimed at confronting and adapting to climate change, as it seeks to guarantee the application of the LPVN, which is more protective of APPs in relation to state and municipal rules that conflict with it.

This conflict between norms arises from the fact that urban APPs are disciplined, at the federal level, by a norm whose logic is around the protection of rural areas. In addition, it seeks to guarantee a minimum protection to these areas which is common throughout the national territory. This causes certain incompatibilities, as Brazil is a country of continental dimensions, with an immense diversity of landscapes; thus, it is impossible for a general rule of limitation of urban space to perfectly fit the different Brazilian territorial realities.

An alternative and possibly adequate scenario would be the municipal competence for the discipline of urban APPs in their respective territories, considering their geographic particularities, provided they are supported by technical agencies and backed by guidelines and criteria defined in federal regulations. It would be a way to recognize the importance of local governance but avoid that the entire discipline of APPs would be under the responsibility of municipalities, which often have weak environmental agencies and subject to pressures from economic sectors more interested in occupying areas until then protected, such as APPs. This scenario corroborates the conclusion of Araújo and Ganem (2016), according to which the effective protection of urban APPs demands coordination between environmental and urban planning legislation at the federal level. In this sense, specific technical aspects should be complemented, at regional and local levels, through regulations of the state and municipal

environmental councils, the watershed committees and the civil defense - provided that these rules, in no case, reduce the protection conferred by federal rules, under penalty of incurring in material unconstitutionality.

The solution for a regulation of urban APPs with more effective practical results should consider, therefore: the factual barriers, arising from the budgetary and technical frailty characteristic of most Brazilian local governments; and the legal boundaries, which limit the regulation of subnational entities, preventing them from reducing the limits of APPs in relation to what is established in the federal law. With this in mind, although we do not consider them ideal, the solutions proposed by jurisprudence and literature seem appropriate for the current context. In other words, in the apparent conflict of norms that regulate urban APPs, the LPVN overrides the LPSU and subnational entities cannot establish protection areas smaller than those provided in the LPVN.

This does not mean, however, that populations precariously settled in urban APPs are less exposed to socio-environmental vulnerabilities potentially aggravated by climate change. There is still a long and complex path of normative coordination between environmental and urban planning norms to be followed.

Therefore, we recommend that the effectiveness of the instruments analysed here, with regard to adaptation to climate change and the reduction of the vulnerabilities of the population living in areas of risk and APP, should be the object of future research. We conclude that these legal solutions to the conflict are adequate, but future works should seek to understand if, in practice, the public policy objectives result well for the population in vulnerable situations.

Another relevant aspect that we consider needs in-depth scientific approach refers to the legal and public policy responses to cases of consolidated occupation in APP by non-precarious constructions and urban infrastructure. In these cases, although occupation offers comparatively less risk to the population, it also exposes them to risks arising from climate events and prevents fundamental ecosystem services from being recovered.

Finally, we highlight that Brazil, being object of important impacts related to climate change, must have active participation of the Government to mitigate the causes and adapt to the consequences of these alterations. Therefore, the norms and instruments of public policies that have been developed in a relatively promising way in the last years need effective application and constant reviews, so that they are sufficient for the preservation of biodiversity and reduction of vulnerabilities to which a significant part of the population is exposed.

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