Occupation of environmentally fragile areas in Almirante Tamandaré, State of Paraná: the right to housing in light of environmental preservation

Ocupações de áreas ambientalmente frágeis em Almirante Tamandaré/PR: o direito à moradia em face da preservação do meio ambiente

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Abstract

This article analyzes the stigma related to informal settlements when the right to housing faces environmental restrictions, and questions the paradigm that associates environmental degradation with informal land occupation and urban poverty. The study that originated the article was carried out in an environmentally fragile area, disputed and pressured by anthropic occupation in the municipality of Almirante Tamandaré, in the Metropolitan Region of Curitiba, State of Paraná. In this study, it was possible to identify situations where the stigma related to informal living conditions hides and legitimizes power structures, more inclined to meet market demands that display an environmentalist discourse than to guarantee the egalitarian right to the city.

Keywords: informal settlements; stigma; right to adequate housing; right to a balanced environment; urban and regional planning.

Resumo

Este artigo analisa estigmas ligados à ocupação para moradia, quando esse direito se depara com restrições ambientais, e questiona o paradigma que associa a degradação ambiental à ocupação informal do solo e à pobreza urbana. O estudo que deu origem ao artigo foi conduzido em uma área ambientalmente frágil, disputada e pressionada por ocupação antrópica no município de Almirante Tamandaré, pertencente à Região Metropolitana de Curitiba/PR. Nesse estudo, foi possível identificar situações em que o estigma da informalidade urbana oculta e legitima estruturas de poder, mais inclinadas a atender a demandas de mercado, apropriadas de um discurso ambientalista, do que a garantir o direito igualitário à cidade.

Palavras-chave: *ocupação informal, estigma, direito à moradia, direito ao meio ambiente, planejamento urbano e regional.*

Introduction

The urban extension of Brazilian metropoles is marked by spatial and environmental segregation that produces precarious settlements in terms of sanitation, housing and urban facilities and services, with great social, environmental and urban demands that escalate poverty. One of its main attributes has been the occupation of Permanent Preservation Areas (*Áreas de Preservação Permanente* – APP), fresh water reserves, *non aedificandi* areas and other areas that are similarly protected by their environmental importance. This aspect becomes a problem when it derives from a fragile relationship between government, society and the market, associated with planning practices and also with lack of compliance in regards to the right to housing which is guaranteed by legislation (Maricato, 2003; Fernandes, 2010).

The lack of effective public policies to act in these scenarios contributes to the denial of the right to housing, which is a fundamental right recognised by 1988 Federal Constitution and by 2001 Cities Statute (*Estatuto da Cidade*). This denial is responsible for sending the most vulnerable segments of the population to less valuable areas that sometimes are subject to environmental protection and lack of urban infrastructure.

In this scenario, this article analyses how the right to housing has been guaranteed when in conflict with environmental preservation and the right to a balanced environment. The right to housing, as defined in the 6th article of the Federal Constitution, will be discussed in light of the habitational issues faced by Brazil. In addition, the article will also analyse the way the right to a balanced ecosystem, as defined in article 225 of the Brazilian Constitution, has been used to deny the right to housing by certain urban planning practices in Brazil.

The article questions the dominating social construction that associates environment degradation with informal land use and with urban poverty, understanding that the State employs an environmental rhetoric as a way of building a consensus, in order to delegitimize the fundamental right to housing environmentally fragile areas that are informally occupied (Acselrad, 2004; Fernandes, 2011). Most specifically, it intends to investigate whether the State differentiates the regulation of formal and informal occupations of environmentally fragile areas and to highlight the consequences of this differentiation if any, in urban policies.

The occupation of an environmentally fragile area in the urban limits of Almirante Tamandaré, in Paraná, has been selected as the subject of this research, in order to allow this issue to be analysed in a real scenario. According to the Coordination of the Metropolitan Region of Curitiba (*Coordenação da Região Metropolitana de Curitiba* – Comec, 2006), this municipality is one of the growing fronts of demographic expansion in the Metropolitan Region of Curitiba (RMC) that is under pressure by occupations of its fresh water reserves. The spatial boundaries of this analysis encompasses the areas under direct and indirect influence of the Karst Aquifer. The occupations already settled in 2010 were the focus of this analysis due to their adherence to the data from latest national census as well as municipal and state legislation in place at the time.

Right to housing and urban informality in the brazilian scenario

According to the Federal Constitution, in its 6th article, public education and health, housing, work, leisure, safety, maternity and childhood protection and social welfare are all considered fundamental social rights[1] and their enforcement is a duty of the State through the implementation of public policies.

It is worth emphasizing that the inclusion of the right to housing in the Brazilian Federal Constitution as a fundamental social right was accomplished on 14/02/2000 by a Constitutional Amendment (#26), 12 years after the Constitution had been promulgated, as result of Brazil's commitment to a number of international social agreements such as the Universal Human Rights Declaration and the International Pact for Economic, Social and Cultural Rights (Saule Junior & Cardoso, 2005).

Besides the Federal Constitution, the City Statute and other federal laws such as; the Social Interest Housing National System Law and the Law 11.977/2009, which regulates the *Minha Casa Minha Vida* Program, also refer to this right and define directives and mechanisms that allow its application.

Considering the totality of these legislations and international agreements, it is important to perceive that the right to housing is not limited to the existence of a basic roof to live under, but instead, it is qualified by a series of elements such as; the quality of the construction, its location, the availability of public services and infrastructure, legal ownership guarantees, affordability, cultural suitability, etc. Therefore, the right to housing can be considered as a subcomponent of broader rights like the right to the city and the right to life (Fernandes & Affonsin, 2014).

In spite of the historical and conjunctural consolidation process of the right to housing in Brazilian legislation, caution is necessary so that a positivist approach is not linked to the right to city and housing. Even if advances in the institutional field are taken into account, the right to housing is still far from being accomplished in Brazilian reality. In fact, along the Brazilian process of urbanization, housing has been treated more like a commodity than a social right (Cardoso, Jaenisch & Aragão, 2017). Its implementation has been limited by "false issues" (Bolaffi, 1975), formulated without considering the intrinsic aspects of the problems that involve housing in Brazil – as a result of the production of excluding spaces and excessive real estate speculation –, due to craving for power and ideologies (Bertol, 2013).[2]

According to Domingues (2013), the State can implement public policies that enforce the right to housing in basically two ways: first, by promoting construction markets that are willing to increase production and the circulation of the housing 'commodity' and that understand the construction and the act of living as inherent to the economic policy; second, by regulating the housing production phases, the housing quality, considering all related services, and the value of urbanized land. As a general rule, the Brazilian State has opted for the first way, by submitting urban policy, urban property and consequently housing, to the principles of economic activities.

By opting for such strategy, instead of a regulatory approach, the cities' central areas with good infrastructure which in general, benefit from better urbanistic planning and less occupation restrictions, are subject to an excessive increase in estate values. As a consequence, the majority of the Brazilian population with wages beneath the minimum required to access urban goods is incapable of purchasing their houses in these areas through the formal real estate market thus, resort to living in informal areas.

> World Bank data informs that out of 1 million of houses produced in Brazil, about 700 thousand are illegal, what proves that most of country's housing production is informal. Such data confirms the tolerance of the public agents with illegality, once according to the Brazilian laws, the housing title guarantees ownership, and as the popular say – who does not have the title is not the owner. (Jansen, 2012, p. 165)

The problem doesn't concern the lack of properties but instead, the lack of tenure warranty which in turn, fevers low quality constructions, especially in illegal areas. This scenario permits the conclusion that "informality is a sub-product of the traditional regulations and violations of right to land and housing" (Holz & Monteiro, 2008).

According to Fernandes (2011), urban informality, which is the result of the breach of the right to housing, brings about serious implications that manifest through several burdens:

I) legal burden; expressed by lack of land titles and legal tenure warranty which exposes residents of informal occupations to permanent risk of eviction by public authorities or by legal land owners, making more difficult the access to basic services such as: credit approval in banks and retailers, postal services, proof of residency, etc;

II) social burden; expressed by marginalization of residents of informal occupations and their impossibility to access the usual benefits of the urban development, including public services, infrastructure, public spaces and collective facilities;

III) urban environmental burden; expressed by fragmentation and precariousness of the cities where the precarious settlements are deeply marked by a number of different health risks, lack of security, environmental degradation, pollution and inadequate sanitary conditions;

IV) political burden; expressed by political patronage where politicians make electoral promises to resolve issues that affect the informal settlements but instead of keeping them, they tend to perpetuate the informality;

V) economical burden; expressed by creation of intrinsically inefficient cities with a costly urban management whereby there is exclusion of informal settlements from the official property taxation system, which results in a loss of potential revenue by the public administration. Noting that the cost of regularization and the unofficial and precarious access to public services become substantially higher than the cost of new and legal urban enterprises.

According to Acselrad (2004), among these burdens, the environmental stigma stands out because, when evoked, it has the support of a big part of the population that replicates the hegemonic thought, enforcing the support of environmental preservation as a priority, without any deeper analysis of the

real scenario or at least, of a possible one. It is exactly this sort of point of view that has enforced the conflict between the right to housing and the right to the environment, as this article discusses.

The right to a balanced environment and the stigmatization of informal settlements

Attempts to conciliate development and environment have been performed since the early 1970s, through a number of conferences, summits and international pacts such as: the Club of Rome in 1968, the 1st United Nations Conference on the Human Environment in 1972, the Eco92, the Rio+5, the Rio+10, the United Nations Conference on Sustainable Development (CNUDS), among others. The cities belatedly appeared in this political process of debates, being only subject of the Brundtland Report, in 1987. This report discussed issues such as: the lack of resources for urban spaces planning in cities of lesser developed countries; the issue related to population distribution in cities and concentration of industrial activities and poverty as the source of urban environmental issues. Such discussions made possible the writing of the 'Agenda 21', a plan of action that promotes a new standard for city development, conciliating actions for environmental protection, social fairness and economic efficiency (Acselrad, 2004; Polli, 2010; and Rickli Neto, 2012).

In Brazil, the right to a balanced environment is supported by several laws, among which, the Article 225 of the Federal Constitution. In its *caput*, this article establishes that "everyone has the right to a balanced environment i.e. people's common use good that is essential to the quality of life" and it declares the Public Power's and the community's duty to act in its defence in order to preserve it for future generations".

Thus, as is the case with the right to housing, the right to a balanced environment is considered by doctrine and legislation, as an extension of the right to life. The ecological balance is understood as a fundamental right once it represents, through its link to human beings, the necessary elements for a better quality of life, such as: health, culture, leisure, etc. From this point of view, the right to a healthy environment is also understood as a fundamental right under the Brazilian legal system (Gaio, 2015).

Fernandes (2010) highlights that the challenge is to make these two values and rights compatible. For that, it is necessary that an anthropocentric concept be adopted as well as that all necessary measures be taken so that they can reverse the current model of urban growth based upon segregation and pollution in such a way, the Brazilian cities can become ecological and sustainable from the socio-environmental perspective.

However, this has not been the case when different policies, related to environmental preservation, are taken into consideration. Urban planning has historically followed modernist models for territorial organization, particularly in respect to the use of tools that organize urban functions in specific zones (Harvey, 1993; Maricato, 2003). In this ordering model, to achieve environmental preservation it either restricts

areas for occupation or it defines types of possible usages over environmental preservation or fragility areas. Such areas, as mentioned before, end up being informally occupied as a result of the Brazilian socio-economic reality and poor Stare actions that, by not guaranteeing the accomplishment of the social aspect of the property and the city, connives with the situation.

According to Polli (2010), the common sense suggests that poor people in the cities and poor cities are in general considered the major causes of environmental problems due to mainly, the supposedly chaotic way they occupy the territory. In this view, the informal settlements are stigmatized as responsible for a good part of what is understood as environmental degradation instead of environmental degradation be understood as the result of political and economic choices for structuring the urban space.

The acceptance of this stigma has led to urban planning processes that use it as resource for reserving the occupation of environmentally fragile areas for specific occupation typologies over which there is more control. An example is the permission granted to residential condominiums, usually targeted to medium and high classes, that are equipped with infrastructural solutions and basic sanitation. However, the type of planning that advocates these type of practices acts according to market interests, even if these practices oppose city interests, without calling for critical reflection or alternatives (Ascelrad, 2005; Rolnik, 2015).

Following this logic, the same State that makes use of the environmental degradation idea in order to criminalize the residents of protected/fragile environmental areas, can sometimes also makes available tools that enable formal occupations in environmentally fragile areas. Such actions are supported by a supposed consensus related to the way it guarantees the preservation of natural resources, allegedly orienting environment and territorial policies.

Acselrad (2004) advocates that the environment, dressed in this universal outfit, befits the purpose of a social consensus which is intended to reconstitute the sense of community, solidarity and common interest, in a world that is socially fragmented, aiming to accommodate the differences in a new interdependent totality. From that bias, it is possible to question whether the environmental issue has been used to disguise the lack of capability of the urban policies to equalize the offer of urban services to the quantity and quality of social demands.

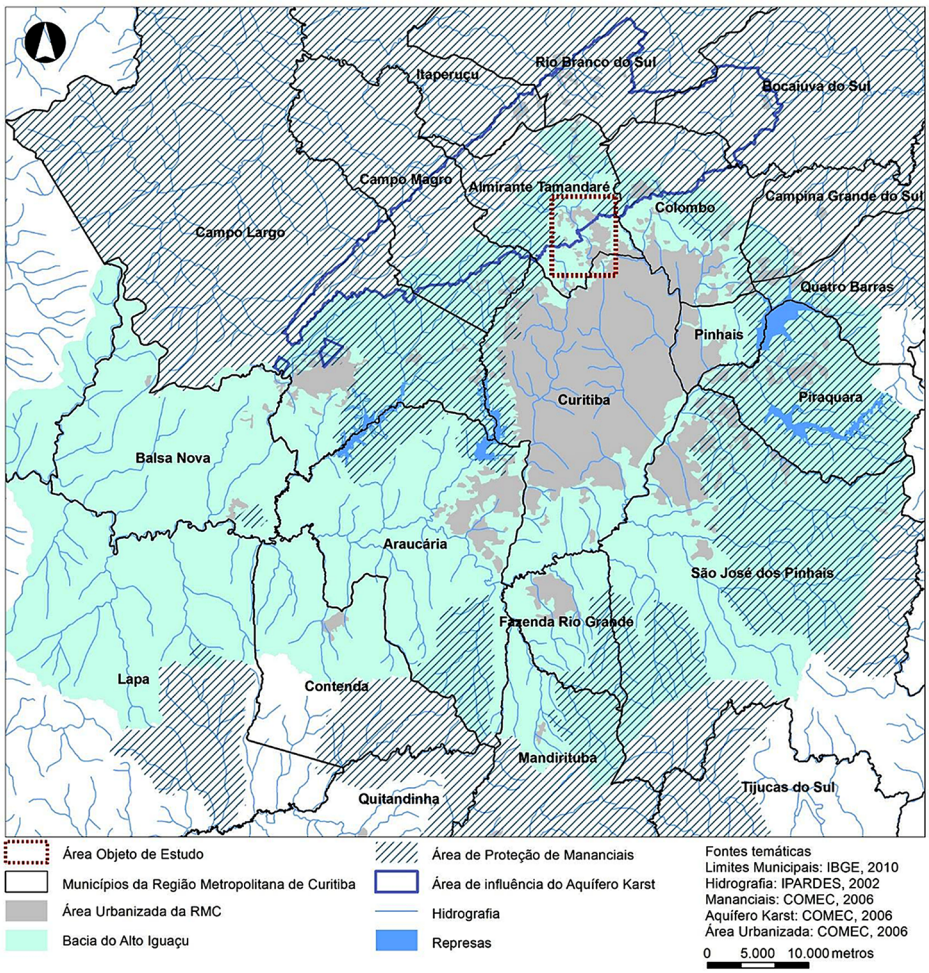
The urbanization process of areas over fresh water sources in Almirante Tamandaré

The RMC, currently made up by 29 municipalities, has been undergoing an accentuated urbanization process since the early 1970s, being the Brazilian metropolitan region that had the highest growth index when considering the averages in the last 40 years, according to data collected by IBGE (2010). Its annual population growth rate has reached spikes around 3.5% and some municipalities have gone even further, reaching rates over 10%. In conjunction, approximately 70% of the RMC territory is catalogued as having either fresh water

sources or environmental preservation areas, what means that, formally or informally, part of these areas is occupied.

Almirante Tamandaré is located at the north of the RMC and about 80% of its territory is located on the Karst Aquifer, an underground water reserve in dolomitic metacalcareous soil that are part of the Capiru Formation (Figure 1). Almirante Tamandaré has been the target of an intense land parceling process since the early 1960s and it is subject to occupations in areas with geotechnical fragility, sharp slopes and subject to flooding. According to Silva (2012), the illegal settlements in Almirante Tamandaré are a metropolitan problem above all, because its origin is linked to the intensification of informal housing spaces production in the 1990's.

Figure 1 – Location of the study area in RMC and in Karst Aquifer



Source: elaborated by the authors, in 2019 and based on IBGE (2010), Ipardes (2002) and Comec (2006) data.

A study performed by Comec in 2002 defined two different zones of influence for rocks of the Capiru Formation i.e. Direct Influence Zone (ZID) and Indirect Influence Zone (ZII), which were characterized in terms of the geotechnical fragility and the vulnerability to occupation of the aquifer's surface.

> Urban occupation in Karst areas usually occurs on the direct influence areas, due to their favourable topographic features. These areas cover the complex Karst dynamic, their underground structures (cavities, caves) and extreme sensitivity zones which must not be occupied due to terrain sinking risk. (Araujo, 2006, p. 14).

The study area (Figure 1) was selected because it is located at the Alto Iguaçu Basin, which is responsible for most of the freshwater supply for the RMC, and also as it an example of a highly intense urban occupation area located over the Karst Aquifer. In addition, it is also subject to geological accidents such as soil collapse and subsidence. This sort of geological accidents are aggravated by increased urban density. As a result, high social and environmental vulnerability rates are also present in this area.

According to Oliveira (2010), the occurrence of urban geological accidents is related to the improper occupation of risk areas. Accidents related to these occupations are result of "evolution of processes that alter the environment which are induced, empowered or escalated by the use and occupation of the land thus leading to social, economic as well as environmental damages and they may even culminate with loss of human life" (ibid, p. 11). In Karst areas where the soil is made up by loose materials, the sinking corresponds to the surface effect related to the natural tendency of coverage materials to fill the gaps and accumulate in the soil cavities (i.e. the process of carbonate rocks dissolution known as karstification or carstificação). These processes can be accelerated or triggered by mining, urban occupation, underground water extraction, intensive agriculture or uncontrolled tourism. When considering urban occupation, sinking can be the result of either the occupation of terrains where undesirable geotechnical behaviour is present, or underground structures which are inadequate to occupations (e.g. caves or cavities), or high-density building concentration. Furthermore, when the occupation of Karst soils is not done in accordance with the predefined levels of occupation, urbanization can cause the contamination of the underground water, due to inappropriate sewage discharge (ibid).

In order to perform this study, about to question the paradigm that associates environment degradation to the process of informal occupation of the land and urban poverty, formal and informal occupations in environmentally fragile areas were identified and State actions were evaluated, in regards to the rules applied to this sort of occupations, in Karst terrains.

According to data collected by the 2010 Census, Almirante Tamandaré had 98,954 inhabitants and 32,594 dwellings, out of which 6,238 dwellings (about 20%) were located in informal housing areas. Silva (2012) accounted 117 informal settlements divided into slums, clandestine or irregular allotments.[3]

According to the Social Interest Housing Local Plan (PLHIS, 2010), 81% of city's housing deficit was composed of the population with average monthly income of up to three times the minimum wage. As per Arretche (2012), this income bracket is made up by people who don't have enough economic capability to assume long-term indebtedness nor adhere to a housing credit service. Therefore, this population group is outside the usually practiced housing policies which concentrate on housing finance as the only possibility for them to access the formal housing market. This part of the population tends to find a solution by moving to areas that are not used by the formal market such as environmental protection areas, or to other arrangements such as shared-housing or even indebtedness with the high cost of renting.

In addition, the PLHIS (2010) identified that 37% of the informal settlements were located in areas subject to flood and landslide. It indicated that out of 6,240 domiciles located in irregular occupations in the city, 1,591 should be resettled. From the total of informal domiciles that needed to be resettled, 50% were located in areas of environmental risk or environmental preservation. The irregular occupations typology in areas of environmental fragility is the most expressive among the several types of risks that the irregular occupations that were appointed as in need of reallocation were subject to.[4]

Results

This research identified the land suitability for use under geotechnical recommendations (Mineropar, 1994) and the Karst Aquifer zoning (Comec, 2002) in order to analyse the realization of the right to housing in areas of environmental fragility and to investigate whether the State differentiates the regulation of formal and informal urban occupations on these areas in Almirante Tamandaré. In sequence, the way the municipality regulates the occupations on these areas was evaluated in accordance with the urban zoning plan in place at the time[5] (city law 002/2006 – Almirante Tamandaré, 2006).

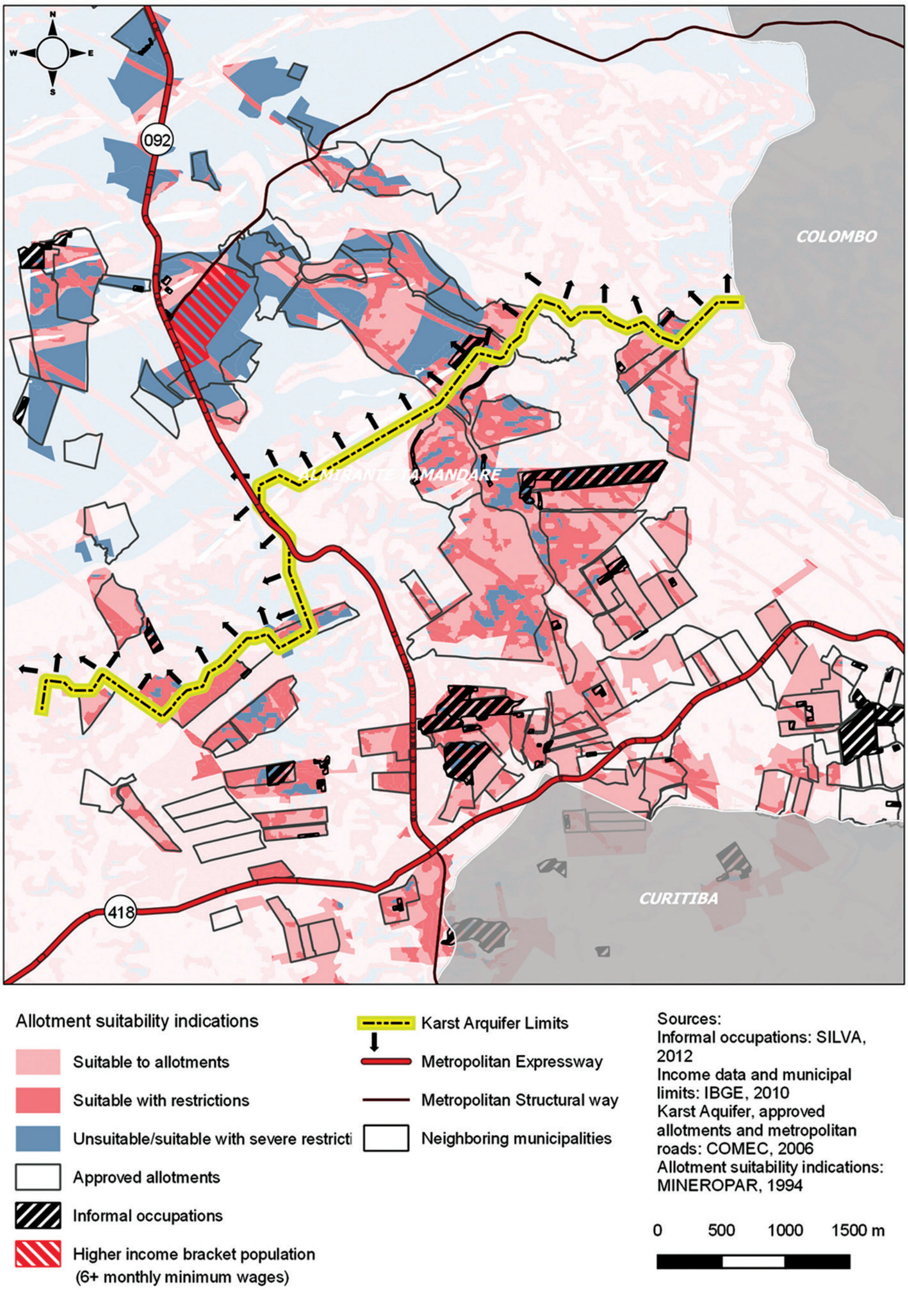
In order to identify formal and informal areas, the following criteria were used: 1) record of approved allotments available in the Curitiba Metropolitan Region Integrated Development Plan (Comec, 2006); 2) census sectors that concentrate higher income population (IBGE, 2010); 3) data survey of informal housing spaces performed during the PLHIS development (Silva, 2012).

Analysis of State regulation on the existing scenario

According to the Geological Geotechnical Mapping Project – Planning on RMC performed by Mineropar (1994), the effectively occupied area in Almirante Tamandaré is characterized by: 1) soil that is improper for allotment, with high susceptibility to floods, Karst sinking and discharge of effluents; 2) soil that is suitable but with restrictions, as shown on Figures 2 and 3. The study emphasizes that the occupation of land over soil that is not suitable for allotments must be preceded by the due technical analysis in accordance with mining and water resources utilization requirements.

In Figure 2, it is possible to see that the allotments were approved over all the urban

Figure 2 – Approved allotments, high income occupations and informal occupations over the allotment suitability indications



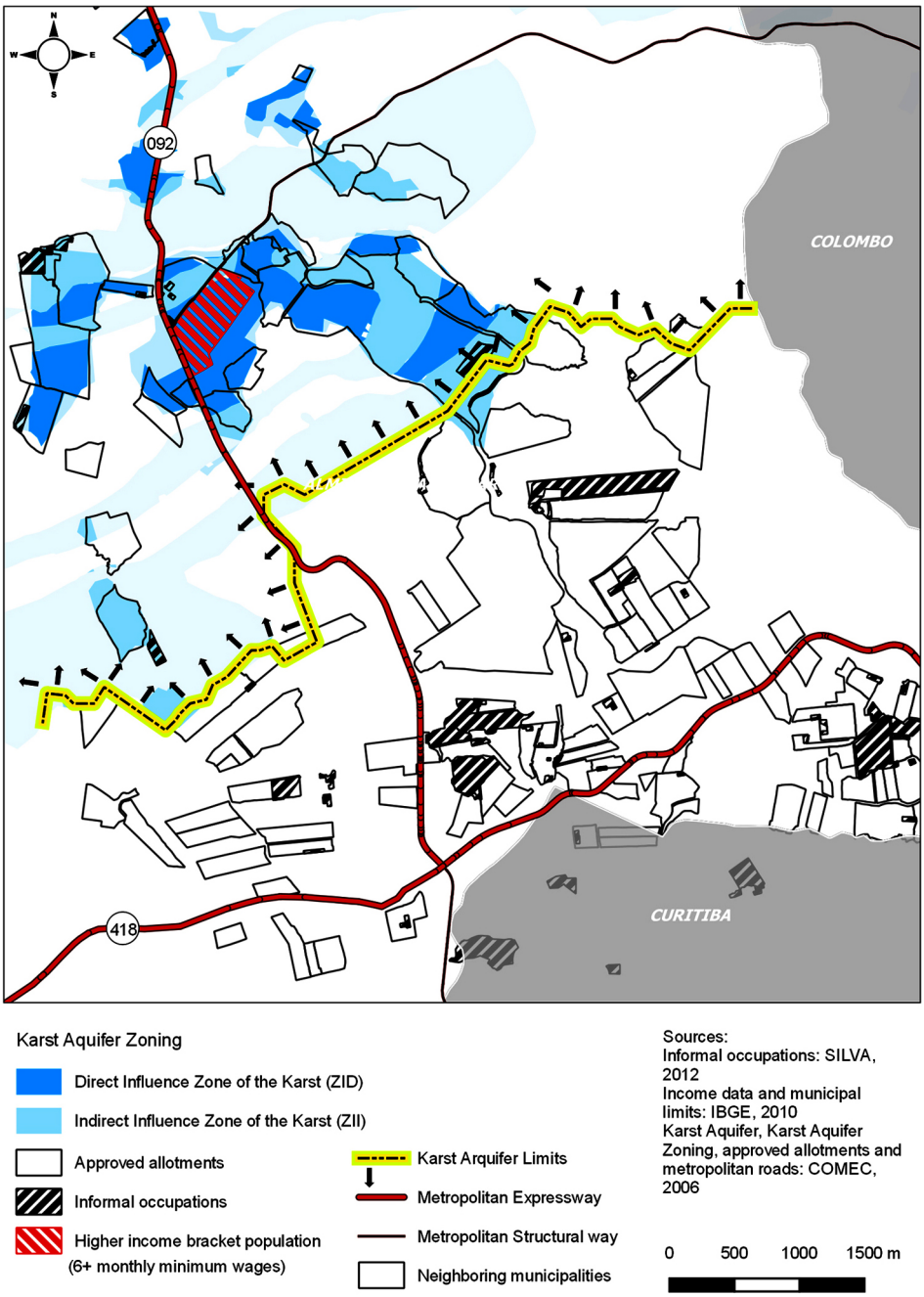
Source: the authors, in 2020, based on Silva (2012), IBGE (2010), Comec (2006) and Mineropar (1994).

Figure 2-A – Legend describing soil suitability for allotments, adapted to the research

U.T.	PREDOMINANT SLOPES	EVALUATION	ALLOTMENT SUITABILITY INDICATIONS
A	0 to 5%	High susceptibility to floods and floods. Source of water resources both superficial and subsurface, sand for civil construction and clay for red ceramics. Suitable for tanks. Unsuitable for allotments, roads and waste disposal. Inappropriate or severely restricted.	Unsuitable or with severe restrictions to allotments
MP	0 to 20%	Low susceptibility to erosion, suitable with restrictions for the implementation of allotments and roads. Suitable for the disposal of solid waste. Suitable with restrictions.	Suitable with restrictions to allotments
	20 to 30%	Low susceptibility to erosion, suitable with restrictions for the implementation of allotments and roads. Suitable for the disposal of solid waste. Suitable with restrictions.	Suitable with restrictions to allotments
	> 30%	Median susceptibility to erosion, unsuitable for the implementation of allotments, roads and the disposal of waste. Permanent preservation. Inappropriate or severely restricted.	Unsuitable or with severe restrictions to allotments
DT	0 to 20%	Severe restrictions for the implementation of residential allotments, discharge of effluents and roads, requiring appropriate technical criteria, in line with mining plans and use of water resources (surface and underground).	Unsuitable or with severe restrictions to allotments
	20 to 30%	Susceptible to karst sinking (soil collapse and subsidences), natural or induced by entropic action.	Unsuitable or with severe restrictions to allotments
	> 30%	Unsuitable for installation of industries, mainly pollutants, or waste disposal. High potential for mining, especially in high slopes.	Unsuitable or with severe restrictions to allotments
CR	0 to 5%	Low / medium susceptibility to erosion, suitable for allotments, roads. Unsuitable for waste disposal. Suitable for allotment.	Suitable to allotments
	20 to 30%	Medium susceptibility to erosion, suitable with restrictions for allotments and roads. Unsuitable for waste disposal.	Suitable with restrictions to allotments
	> 30%	Medium susceptibility to erosion. Unsuitable for allotments, roads and waste disposal. Permanent preservation.	Unsuitable or with severe restrictions to allotments
GD	0 to 5%	Medium susceptibility to erosion, suitable with restrictions for allotments and roads. Unsuitable for waste disposal.	Suitable with restrictions to allotments
	5 to 10%	High susceptibility to erosion, suitable with restrictions for allotments and roads. Unsuitable for waste disposal.	Suitable with restrictions to allotments
	10 to 20%	High susceptibility to erosion, suitable with restrictions for allotments and roads. Unsuitable for waste disposal.	Suitable with restrictions to allotments
	20 to 30%	High susceptibility to erosion, potentially unstable to landslides, suitable with restrictions for allotments and roads. Unsuitable for waste disposal.	Suitable with restrictions to allotments
	> 30%	High susceptibility to erosion. Unsuitable for allotments, roads and waste disposal. Permanent preservation.	Unsuitable or with severe restrictions to allotments
DB	0 to 20%	Medium / low susceptibility to erosion, suitable for allotments, and roads. Unsuitable for waste disposal.	Suitable to allotments
	20 to 30%	Medium susceptibility to erosion, suitable with restrictions for allotments and roads. Unsuitable for waste disposal.	Suitable with restrictions to allotments
	> 30%	Medium susceptibility to erosion. Unsuitable for allotments, roads and waste disposal. Permanent preservation.	Unsuitable or with severe restrictions to allotments

Source: the authors, in 2020 based on Mineropar (1994).

Figure 3 - Approved allotments, high income occupations and informal occupations over Karst zoning



Source: the authors, in 2020, based on Silva (2012), IBGE (2010) and Comec (2002 and 2006).

area under analysis[6] and that there is no concentration of allotments on certain types of soils classified by Mineropar (ibid.) as suitable with restrictions. It was verified that the majority of the allotments dates from a period before the Mineropar (ibid.) study, therefore they wouldn't have been influenced by the geotechnical suitability directives. As such, the allotments setup precedes the regulation of Karst land use by the state organ. From 1994, it is the Municipality's responsibility to regulate the directives on land use in these allotments and to restrain occupation of areas that are not considered suitable for this end.

In Figure 2, Mineropar classifications (ibid.) were grouped in three major classes, according to their suitability for allotments. Figure 2-A includes the original classification from the organ charts. The CR soil, with up to 5% declivity, and the DB soil with up to 20% declivity, are grouped under the "Suitable for allotment" ("*adequados para loteamento*") class.

The types of soil either unsuitable or with severe restrictions to allotments are present in the Direct Influence Zone (ZID) of the Karst (Comec, 2002), as per described in Figure 3. The ZID is defined as located directly over the dolomitic metacalcareous soil, featured by its high environmental vulnerability and for being directly linked to the water production and recharge of the Aquifer (ibid.).

In this area, this study indicates that although in several cases the "de-urbanization" is technically advised, such as in areas under the direct influence of the Karst, this sort of measure must be only considered in scenarios of extreme natural fragility and/or when the occupation suggests a high people safety risk. In addition, it indicates that the city expansion and urban densification should be concentrated along the municipal borderline with Curitiba, and it concludes that, even if there are environmental conflicts between the occupation and the Aquifer, it would be viable to implement actions for its protection (ibid.). That is, it relativizes actions to be taken on the subject of occupied fragile areas, indicating the need for further specific studies that could highlight the real need for settled household relocations.

Figure 2 displays that the only area which concentrates the city's higher income bracket population (in Almirante Tamandaré, this equals to 6+ monthly minimum wage, as per 2010 IBGE census data) is located on unsuitable soil or soil with severe restrictions for allotments.

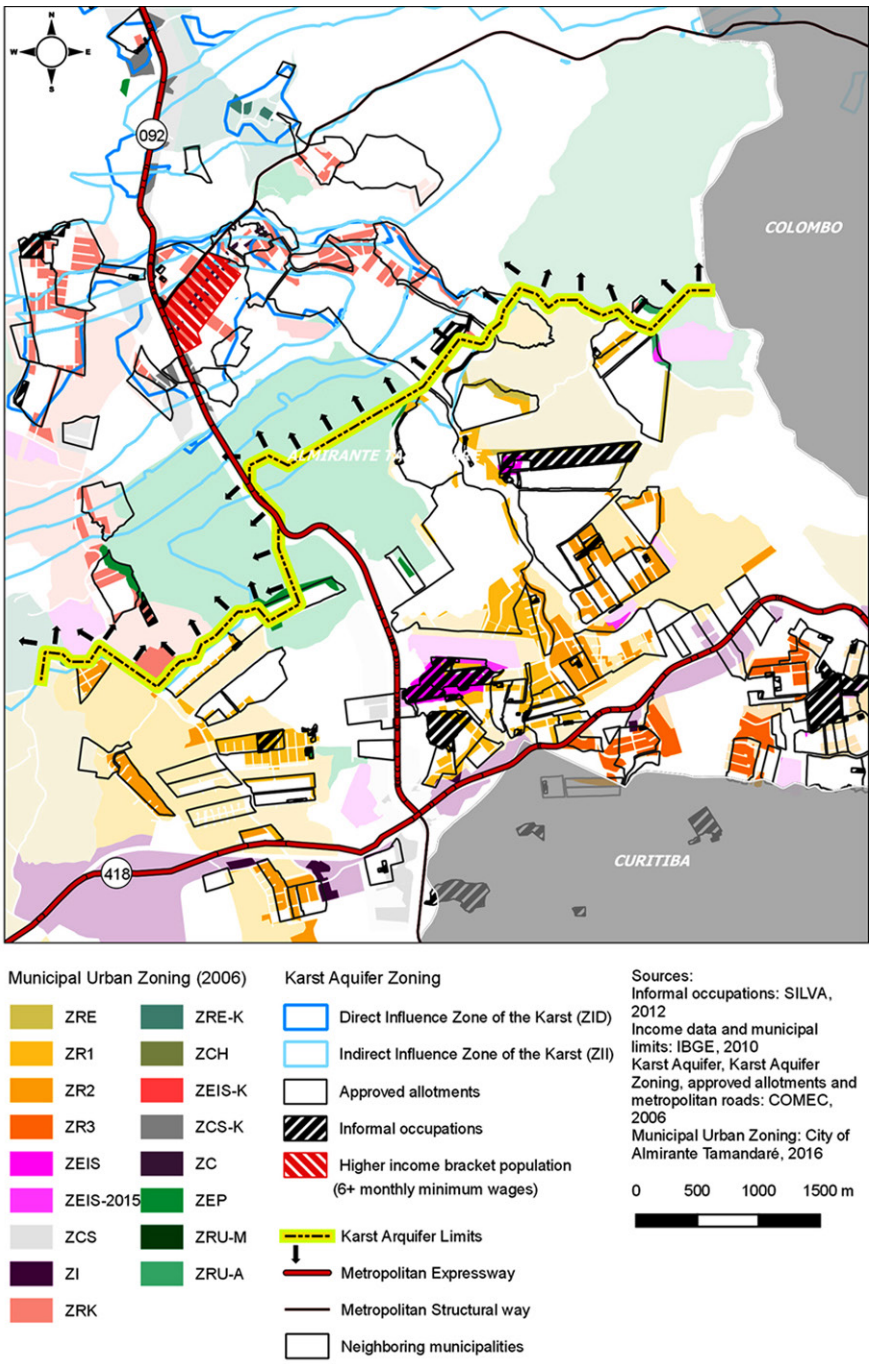
From Figures 2 and 3, it is also notable that informal occupations (clandestine and irregular) were located predominantly over soil classified as suitable for allotments, even if directives recommend superficial draining control and sewage infrastructure for these areas.

Analysis of Municipal regulation of the existing scenario

Figure 4 shows the city zoning performed in 2006, following the approved state directives aiming to regulate the land occupation over the Karst Aquifer, through the definition of residential zones with more or less occupation restrictions according to the influence of the aquifer.

As is shown in Figure 4, the region with higher income is under the regulation of Karst Residential Zone (ZRK). Such zone was created to regulate land use in areas under direct Karst influence, and it has a higher level

Figure 4 - Approved allotments, high income occupations and informal occupations on Municipal zoning



Source: the authors, in 2020, based on Silva (2012), IBGE (2010), Comec (2002 and 2006) and Almirante Tamandaré City Hall (2006).

of restrictions to occupation when compared to same typology areas that are not located on land under the aquifer's influence. In ZRK, the minimum lot area is 600m² while in other residential zones, the minimum lot area is either 360m² or 450m². The increase in ZRK minimum lot area was motivated to reduce the zone's constructive density, under the pretext of increasing the preservation of the area.

Regarding the informal settlements, most of them are located outside the aquifer's environmentally fragile areas, where residential use is allowed by zoning, in Special Zones of Social Interest (Zeis) or Residential Zones (ZR).

In general, this case study shows that the higher income occupations were those occupying land over the most fragile soil while the informal ones, with few exceptions, were occupying land either the more suitable soil or suitable but with parcelling restrictions, considering the geotechnical directives. This practice opposes the usual stigma related to informal occupations in preservation areas, and contributes to vouch that the environmental stigma of informality is a social construction.

This stigma holds the hegemonic conception that urban planning follows urbanistic parameters considered ideal and suitable for environmental preservation and the cities' urban quality. Following this conception, the urban disorder would be strongly associated to the irregular urban occupation process and environmental degradation, which justifies removal or reallocation (Compans, 2009).

The emphasis given to the discourse of environmental risk, that blames informal occupations for environmental degradation, is part of the *modus operandi* of state actors when considering the territorial ordering in Almirante Tamandaré as a way to justify removals. Among the most emblematic cases is the Vila União Occupation, located in the Bonfim suburb in a Karst fragility area where 500 families were living in. This occupation started in 1995 and was subject to an eviction in 2006, which was justified under environmental fragility and unsuitable urban premises (Terra de Direitos, 2006).

This environmental speech is also present in the city's planning and housing management instruments. When analysing the data on irregular occupations selected for resettlements by the current version of the Almirante Tamandaré PLHIS, out of the total of 1,591 domiciles to be resettled, 798 resettlements (about half the total) were motivated by their location in areas under environmental preservation interest or environmental risk.

Further investigation on whether such irregular occupations are effectively in areas that don't allow their regularization, must be object of a deeper study about the PLHIS. However, it is worth questioning the visibility given to informal occupation on environmentally fragile areas by the public administration discourse, which never discusses issues like the selective flexibilization which is typical of urban planning (Acselrad, 2004; Polli, 2010), and which produces environmental damages that are allowed by the Public Power. That is, the housing policy discourse based on environmental biases and therefore the planning of municipal territories tend to hide the existence of formal occupations in environmentally fragile areas.

Despite the stigma, the informal settlements are legally recognized as part of the city's usual development by demarcations like Zeis (Special Zones of Social Interest) for land regularization as part of the municipal zoning. It is worth emphasizing that although these settlements acquired their recognition through the Zeis demarcation in 2006, so far very little has been done to effectively regularize this population. This is notable when considering that the number of irregular domiciles was kept unaltered from the studies that were done at the time of the Zeis demarcation in 2006 until the subsequent figures used for the PLHIS in 2010 and its latest update in 2016.

Final considerations

The performed analysis have confirmed the hypothesis which proposed that the stigma of informality related to urban environmental burden is an ideological social construction, because in the analysed area, the formal settlements were the ones located on areas that presented geological risks when compared to the informal ones, and that the informal settlements are in fact the ones that are subjected to removals under the prerogative of environmental protection.

This fact has highlighted the first sign of break in paradigm pointed out in the theoretical referential of this research i.e. that the informal occupations would be occupying more environmentally fragile areas. Contrary to popular belief, in Almirante Tamandaré, informal occupations are located predominantly in areas where municipal and state regulations allow allotments and where their regularization for residential use is possible, so much that some have been demarcated as land regularization Zeis.

In an initial analysis, it can be said that the environmental stigma is not applied to informal settlements in the city. However, the non-existence of informal settlements in land over soil that has not been indicated as appropriate for allotments i.e. in areas of direct or indirect influence of the Karst Aquifer, may suggest the adoption of urban planning processes that make use of means like the restriction of these areas for urban typologies over which there is more control. Such practice is evident when considering that the total of informal settlements located in areas categorized as of environmental preservation interest are marked as areas to be removed and/or resettled by the PLHIS (2010) while concurrently, the higher income allotments in environmentally fragile areas were not considered by municipal law as areas for land regularization or removal. This fact shows that a different treatment is given to populations of high and low income in regards to municipal regulation.

The presented figures identify that flatter areas and therefore, areas more adequate for allotments, correspond to areas of direct influence of the Karst, therefore susceptible to Karst sinking and improper for allotments as per Mineropar (1994) recommendation. This study identified the existence of higher income areas (within the spatial and temporal boundaries of this research) on these fragile areas where allotments are not recommended by state regulation.

Furthermore, the research identified the absence of irregular occupations in these areas. Understanding that the more environmentally fragile Karst areas are also the flatter ones thus, most valued by the market (Araujo, 2016) , helps to comprehend that the logic for structuring the urban space according to estate valuing guidelines contributes towards the low income population occupying less valued areas, with more rugged topography on land considered by the geotechnical directives as more suitable or suitable with restrictions for urban occupation. The municipal regulation allows the allotment of unsuitable areas and areas with severe allotment restrictions by higher income population sectors, for which it defines larger lots under the excuse of promoting occupations with low constructive density. It is worth to mention that there are no mechanisms that can enforce the low constructive density of these areas, besides those that are strictly necessary for the issue of the construction permit, the occupation license, as well as preventive inspections performed by town hall officers upon isolated complaints. Thus, there is no guarantee that formal occupations were effectively fulfilling the laws and respecting the environmental fragility of the area.

The informally occupied areas may present risks that justify their resettling and the legitimacy of these actions is not challenged. Questions are asked in regards to the different treatment that is given when informal occupations on suitable areas are on the spotlight while formal occupation of unsuitable areas are hidden into obscurity even if they may represent a risk to the environment and the settled population.

Questions arise about the state actors modus operandi that are responsible for the urban regulation policies supported by an environmental rhetoric, but that is not always connected to policies that can guarantee the environmental preservation effectiveness once they do not take into account the established social production dynamic of the space. It seems an issue the State omission, concerning the enforcement of the right for these populations to stay where they are, with their particularities, at the same time that it allows formal occupations to remain in areas with geo-environmental risks.

Although better and more adequate installation conditions (e.g. infrastructure, sanitation) can be associated with formal occupations, particularly high-income ones, the offer of public services and urban infrastructure is a State responsibility, as well as the due inspection to guarantee that the services and resources are being used in favor of the community. Occupations where lots have larger areas do no guarantee that there won't be subdivisions of these areas in order to implement condominiums of small townhouses, frequently with no control and regulation by the city. Moreover, the occupation of environmentally fragile areas by higher income populations do not guarantee that there won't be irregular sewage discharge on Karst area especially when there are no proper operating public inspection systems.

The effective compatibilization between the right to a balanced environment and the right to housing demands a change in attitude of the public power so that it can gradually intervene in the economic and social order by establishing policies to regulate the use and development of the urban space.

According to Pires (2016), the role of the State in Latin American urbanization, as a guarantor of urban conditions in order to reproduce social structures is an abstract proposition considering that in different moments, it acts to guarantee interests that are not necessarily coincident i.e. global reproduction and private accumulation. According to the author, the knowledge of specific urbanization processes must lead to question the public orientation associated with the State in a simple manner, considering the heterogeneity of the dependent capitalism. On the contrary, he suggests that it is necessary to know the political processes, which in different moments are a concrete reality to State intervention.

Pirez (ibid.) defends the State orientation be external to that of the market as a condition to allow the production of urban spaces to stop being exclusively developed in a commercial sense so that, as a consequence, urban land and housing can be consumed as usable goods, out of the circuit of mercantile (re)production. The omission observed in Almirante Tamandaré, within the temporal and spatial boundaries set by the research, should not constrain the local public power from playing the role of regulator, however this knowledge must allow for change of direction in decision making processes.

At last, this research does not intend to demobilize efforts that ensure environment preservation by municipal management. However, it suggests that the current practices which are mainly supported by the idea that territorial planning can be the one thing that guarantees environment preservation are generic and that most of them are enforced without a clear definition that can collaborate to an effective social transformation and also guarantee a balanced and fair urban environment.

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Notes

(1) Social rights, positive benefits provided by the State which are either directly or indirectly enunciated in Constitutional rules that make possible better living conditions to the least favoured, thus, intended to accomplish social equality. Such rights emerged in the context of social constitutionalism; a state model started from liberal revolutions in XVIII century. It was basically concerned about public freedoms and therefore, it had the basic duty to guarantee individual freedom, keeping Public Power away from private reaching and enforcing formal equality (Saule Junior & Cardoso, 2005).

(2) In order to understand the interference of the capitalist model of urban space production with this research issue, it is necessary to elaborate on the "false issue" of housing, that perpetuates the lack of housing solutions. Therefore, the discussion has been brought to the local context: Bertol (2013) analysed that in Curitiba, which is the main city of the metropolitan region where Almirante Tamandaré is also located, "the housing issue is not intrinsically related to the process of population growth […] as a simple result of high populational demand in contrast with either low housing offer or quick disorderly growth" (p. 147). In this approach, the contradictions between space and capital in regards to urbanization and capital-work relationship, disappear. Differently to what the false issue leads us to understand, the real estate market in Curitiba is well structured and it has been capable of delivering housing units and to make use of the space to value the capital. From the moment that a public agency, responsible for housing policies, does not challenge the processes that hold back the production of popular housing, due to urbanization policies geared to market interests, it commits to an uneven production of space and to reproducing false housing issues as well as lack of solutions. Bertol (ibid.) regards as lack of solutions the popular housing proposals that do not intend "to actively act in face of the existence of agents present in space production and real estate speculation" (p. 149).

(3) According to categorization proposed by Silva (2012), slums are self-produced spaces by populations that don't have access to formal housing, in which they become a "space modelling agent" (p. 121). Irregular or clandestine allotments are fractions of land that have different degrees of irregularity being the clandestine allotments those that are implemented without authorization or acknowledgment of the public agents; and the irregular allotments are the parcelling of lands that although approved by public agents, were implemented in disagreement with the existing laws or don't have the due registered title.

(4) The PLHIS (2010) classifies the occupations in need of reallocation in six types: irregular allotments (424 houses); railway area (201 houses); Municipality areas (261 houses); preservation areas (614 houses); private lots (32 houses); and mixed areas (59 houses). In total, the Plan appoints 798 houses for relocation due to their location in areas where there was a protection interest or that presented environmental risk.

(5) The master plan of Almirante Tamandaré was revised and republished in 2018 (complementary law n. 77/2018). However, until the conclusion of this article, the zoning and land use law revision wasn't published. Thus, the municipal law n. 9 002/2006 was used in this analysis.

(6) Figure 1 indicates the spatial limit of the research, over the municipal limits and the extension of the aquifer.

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