
MANAGEMENT OF PRESERVED TERRITORIES: FAR BEYOND THE PRESERVATION OF NATURE

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ABSTRACT

The present paper intended to analyze the importance of the preservation of territories, of land strips in Brazil and Argentina, based on work developed with Universidad Nacional Del Litoral, Universidade Federal de Santa Catarina and Universidade Federal de Campina Grande, having as research question: “What elements do we need to take into account for urban planning focused on disaster prevention through environmental protection?” The method used was the inductive one, together with analysis of the laws relevant to the studied case and documents previously selected, as well as a field study at the analyzed conservation units. The present study is important for a reflection on concrete actions for the preservation of ecosystems, assuming that, if the management model can be confirmed, it will have a positive repercussion on the maintenance of species of animals and plants, watersheds, surface and ground springs, and disaster prevention, which amount to a wide range of ecological services that directly benefit human life.

Keywords: development; disasters; environment; protection.

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*GESTÃO DE TERRITÓRIOS PRESERVADOS:
MUITO ALÉM DA PRESERVAÇÃO DA NATUREZA*

RESUMO

O presente trabalho teve como escopo analisar a importância da preservação de territórios, de faixas de terras no Brasil e Argentina, a partir de trabalho desenvolvido junto à Universidad Nacional Del Litoral, à Universidade Federal de Santa Catarina e na Universidade Federal de Campina Grande, tendo como questão de pesquisa norteadora: que elementos é preciso levar em consideração para um planejamento urbano focado na prevenção de desastres através da proteção ambiental? O método utilizado foi o indutivo, com a análise das leis pertinentes ao caso estudado e documentos previamente selecionados, bem como um estudo de campo nas unidades de conservação analisadas. O presente estudo é importante para se refletir acerca de ações concretas na preservação dos ecossistemas, partindo do pressuposto que se verificando o modelo de gestão será possível ter-se uma repercussão positiva entre a manutenção das espécies de animais, vegetais, dos mananciais de água, das nascentes, sejam superficiais ou subterrâneas e a prevenção de desastres, o que se constitui num grande espectro de serviços ecológicos que vão beneficiar diretamente a vida humana.

Palavras-chave: desastres; desenvolvimento; meio ambiente; proteção.

FOREWORD

The present paper intended to analyze the importance of the preservation of territories, of land strips in Brazil and Argentina, based on work developed with Universidad Del Litoral, Universidade Federal de Santa Catarina and Universidade Federal de Campina Grande, having as problem the following research question: “What elements do we need to take into account for urban planning focused on disaster prevention?” The method used was the inductive one, together with analysis of the laws and documents, as well as a field study.

The present study is important for a reflection on concrete actions for the preservation of ecosystems, assuming that the management model can have a positive repercussion on the maintenance of species of animals and plants, watersheds, surface and ground springs, thus resulting in disaster prevention, of all which amounts to a wide range of ecological services taken into account in urban planning.

The choice of these two countries for studying was stimulated by their large existing biodiversity, placing them in the ranking of the ten most biodiverse countries by continent, according to the Global Environment Facility Benefits Index (THE WORLD BANK, 2012), in addition to the aspects of the legislation that rules on these areas. From this perspective and for comparison purposes, two important territories with similar characteristics were chosen, the city of Florianopolis in the state of Santa Catarina, Brazil, and the city of Santa Fe in the state of the same name, in Argentina. Both suffer from the effects of rainfall and lack of planning, although the latter has progressed, after a major flooding in the past.

Thus, the objectives of this essay were to analyze the functions of protected areas or conservation units, as well as to verify their ecological functions more broadly, including their relevance for the urban planning in the field of disaster prevention and ecosystem maintenance. This is because these areas, according to the defense made here, are vital for the maintenance of environmental quality and environmental ecological functions, especially in the context of climate changes, which are inexorable. Therefore, in the light of the elements presented in this article, protection is not superfluous or unnecessary, but is an essential instrument for socio-environmental and urban planning.

The newness and originality of this article lie in the opening of an empirical-theoretical outlook to treat conservation units as important

elements in disaster prevention; it also considers them as urban planning instruments, both around and within cities, whether for thermal comfort, drainage improvement, protection of river springs that supply urban, riverside and fishing clusters, among other possibilities. Thus, this article will begin with a review of the legal and environmental assumptions for preserved areas and then present the cases of Florianópolis and Santa Fe.

1 NATURE PRESERVATION LEGAL UNDERTONES

The formation of conserved and preserved areas known as Conservation Units (CU) is considered of utmost importance in the preservation of ecosystems, causing an incessant search for conservation and protection of the environment. According to Drummond (1999), the creation of CUs has established itself in the world as the most diffuse nature protection strategy by means of the defense of natural resources. These units are primarily intended to safeguard biodiversity under special Government protection.

A milestone in modern CU policy was the creation in 1872 of Yellowstone National Park, in the United States. Since the late nineteenth century, the number of national parks has multiplied worldwide, thus becoming the most popular and traditional type of protected natural space. This US initiative was gradually followed by several countries, such as Canada, New Zealand, South Africa, Australia, Mexico, Argentina and Chile. Brazil, however, took more than 60 years after Yellowstone to enter the natural area protection collective (DEAN, 1996; FRANCO; DRUMMOND, 2009).

In 2000, in Brazil, Law 9,985, which served as a systematizing framework for Conservation Unit modalities in Brazil – hitherto devoid of an organic structure and clear legal protection – as it provided for environmental protection instruments to form a network of areas that can be protected for the present and future generations, in an allusion to the intergenerational human right to the environment; is certainly stands out as the most consistent environmental policy in Brazil.

The National System of Nature Conservation Units (SNUC) was responsible for making available legal mechanisms for the creation and management of the CUs to the federated constituents and to the private initiative. Civil society was entitled with participation in the administration and regulation of the system, thus enabling the development of joint strategies for natural spaces to be preserved, strengthening and

enhancing the relationship between the Government, the citizens and the environment. According to the National Register of Conservation Units (CNUC) (BRASIL, 2019), as of 2014 there were 1,113 Conservation Units in Brazil. Figure 1 is the most up-to-date representation of conservation units in Brazil.

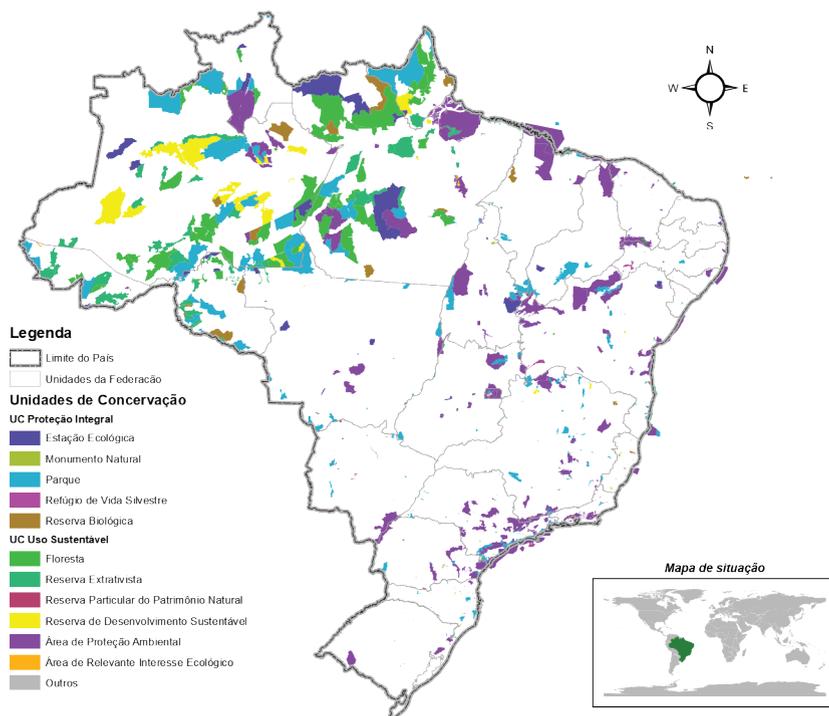


Figure 1 Distribution map of conservation units in Brazil.

Source: Brasil (2018).

As regards Argentina, according to Administración de Parques Nacionales (APN) (ARGENTINA, 2019), in 2018, Protected Natural Areas (ANP) were a network of protected natural areas, 39 of which were administered by the central government and covered 13% of the country's continental area. In addition, the network under provincial and municipal administration has 490 areas included in the Argentine Federal System of Protected Areas, amounting to 35.6 million hectares. Provincial and municipal parks, as well as private reserves, do not depend on the APN and are ruled by Law 22,351, from 1980.

Between 1963 and 2003, a large part of provincial protected areas was created without a specific legal framework. These designations were made by laws, decrees and resolutions in the absence of specific legislation. Consequently, the created areas did not have defined objectives or management plans, and were only limited to the conservation of environments and their fauna, associated with the smallest possible anthropogenic intervention. Figure 2 shows the updated version of protected areas in Argentina. It is important to say that, like Brazil, Argentina is a Federation and therefore has its provinces, which have autonomy over their territory.



Figure 2 Federal System of Protected Areas in Argentina.

Source: SIB (2019).

2 CONCEPTUALIZING CONSERVATION UNITS

2.1 BRAZIL

The expansion and increase in the number of Conservation Units over the last few years, even though they were created in an “uneven and discontinuous way, shows that the CU creation policy has been

consolidated, becoming the most durable and possibly the major national nature conservation policy” (DRUMMOND; FRANCO; OLIVEIRA, 2010, p. 351). However, monitoring the way in which natural resources are used by “resident” populations – and also by companies – in and around these areas is an obstacle to protecting these ecosystems.

Conservation Units are understood to be “areas with natural characteristics of relevant value, with protection guarantees and maintained under special protection regimes” (FELDMANN et al., 1992, p. 144-145); well, as they are

[...] public or private geographic areas (part of the national territory) endowed with environmental attributes, requiring their compliance by law with a public interest legal regime; this means they should remain relatively unchanged and be subject to sustainable use, with a view at the preservation and integrity of samples of all the diversity in ecosystems, protection of the evolutionary process of species, and the preservation and protection of natural resources (SAMPAIO, 1993).

Such definitions synthetically express an attempt to legally trace the limits of the scope of CUs, stressing that the protection of these areas is ensured at the three levels of government, and emphasizing that only areas of public interest are subject to this legal regime. The CUs can serve both as subsistence areas for traditional families and as living research laboratories, and they can be associated with a productive activity or even intended for full protection, serving as a great genetic bank of species and a protection for river springs, watercourses and aquifers.

CUs have been growing significantly in Brazil in recent decades, playing a key role in ensuring the conservation of biodiversity, especially in a country such as Brazil, with its vast territory and immense biodiversity spread across several biomes and ecosystems, thus curbing the dilapidation of environmental heritage. However, there are institutional and unofficial attacks that weaken this protection policy through successive episodes of degradation, alteration and conversion of the biota to make way for productive activities and the construction of the most diverse forms of infrastructure, such as condominiums, farms, and roads, and which may be accompanied by a fragile environmental licensing that compromises water sources and cause soil waterproofing, to name but a few. Hassler (2005) already pointed out the importance of these conservation units as true genetic banks of natural resources for future generations, which makes them priceless environmental assets.

According to Drummond, Franco and Oliveira (2010), the creation of CUs in the past 70 years has moving against this expansionist and opportunistic trend. It has acted as an important strategy to counter the impacts of these patterns of unbridled territory occupation and careless use of natural resources. It allows for the survival of areas where processes of biodiversity reproduction and biological evolution take place without the extreme impacts resulting from human actions (PÁDUA, 1997). However, Henry-Silva (2005) points out that this environmental protectionist policy is under constant threat, mainly due to a lack of public investment in this sector, which is another weakening element in the Brazilian environmental policy.

In addition to national parks, as mentioned, other categories gradually emerged (biological reserves, wildlife refuges, national forests, etc.), with the most varied objectives of preserving, conserving and controlling the exploitation of natural resources (NASH, 1982).

In Brazil, the first registered proposal to create national parks came up actually quite early in the day. In 1876, engineer André Rebouças (1838--1898) revealed great foresight by suggesting the establishment of national parks in two locations: one on Bananal Island, on the Araguaia River, and one on Sete Quedas Falls, on the Parana River (DEAN, 1996; PÁDUA, 1997). Many years later, national parks were in fact established in these two places – Araguaia National Park in 1959 and Sete Quedas National Park in 1961, although the latter was destroyed in 1980 to make way for the Itaipu Hydropower Plant Dam Lake.

According to Padua (1997), the first Brazilian national parks appeared only in the 1930s; the first park established in Brazil with the explicit objective making protecting nature a state government responsibility was Cidade State Park, now Capital State Park, established on February 10, 1896 by Decree 335, in the city of São Paulo.

Over the past seventy years, the growth in the number of Brazilian Federal Conservation Units and in the area protected by them showed some remarkable trends. Mainly, the increase in the number and CU areas, which every decade, albeit unevenly, indicates and demonstrates that the CU establishment policy has become prominent and is possibly considered as the main national conservation policy of the field of nature conservation. According to Law 9,985/2000, states, the Federal District and municipalities may also create CUs in their territories, as the environmental protection policy is also their responsibility, as laid down

in the 1988 Federal Constitution itself. The major issue is management of these spaces and, according to Santana et al. (2016), in spite of that, their existence is already a major advancement in environmental protection, as there are rules and a legal framework to protect against possible abuses.

2.2 Conceptualizing protected natural areas in Argentina

In the Argentina context, the Commission for National Parks and Protected Areas conceptualizes these territories as follows: “Un área de tierra y/o mar especialmente dedicada a la protección y mantenimiento de la diversidad biológica, y de los recursos naturales y culturales asociados, y gestionados a través de medios legales o otros medios eficaces” (ALFONSÍON; ALBERTO, 2016). That is, an area of land and/or sea dedicated specifically to the protection and maintenance of biological diversity and the associated natural and cultural resources, and managed by legal or other effective means.

Under recommendations from that organization, all management categories should match this definition. Although these units meet the general guidelines in this definition, in practice, the specific purposes for which protected spaces are created are diverse. In its Article 3, the Santa Fé Provincial Law 12,175 from October 30, 2003, Argentina, defines Protected Natural Areas as:

Every environment in the territory that, while maintaining its original aspect without major changes caused by human activity, is subject to a legally established special management and intended to fulfill conservation, protection and preservation objectives for its flora, fauna, landscape and other biotic and abiotic components of their ecosystems (SANTA FE, 2003).

The Argentine legal system advocates the possibility of establishing a model based on a sustainability matrix, as well as the possibility of full protection, like in the Brazilian case. Moreover, it is understood that the establishment of protected natural areas is a relevant tool for the conservation of biomes, ecosystems and species of fauna and flora, in particular by a clear delimitation of their boundaries and the regulation of the use and occupation of the territory based on social and environmental characteristics, with handling and management objectives defined according to the level of protection desired for each area (MEDEIROS, 2006; MILANO, 2001; RODRIGUES, 2005). These areas become strategic as one has a vision for the protection of genetic and especially mineral wealth, which are under economic pressure.

3 PROTECTION OF NATURE IN BRAZIL AND ARGENTINA

3.1 The National System of Conservation Units (SNUC)

Especially since the 1980s, the evolution of Brazilian environmental policies and of a specific legislation geared at environmental protection become clear. Table 1 shows significant examples of federal environmental legislation, with The National System of Conservation Units (SNUC) standing out.

Table 1 Legal instruments

Legal instrument	Date	Abstract
Law 4,771	15-Sep-65	Establishes the New Brazilian Forestry Code
Law 5, 197	03-Jan-67	Fauna Protection Law
Law 6,938	31-Aug-81	Provides on the Brazilian National Environment Policy
Law 7,347	24-Jul-85	Rules on the public interest civil action of liability for damage caused to the Environment
Federal Constitution	05-Oct-88	Deals with protection to the Environment in Article 225, Chapter VI
Decree 750	10-Feb-93	Provides on the cutting, exploitation, and suppression of primary forest or in advanced and middle stages of Atlantic Forest regeneration.
Decree 1,922	05-Jun-96	Provides on the acknowledgement of Private Natural Heritage Reserves
Law 9,605	12-Feb-98	Environmental Crime Law, in what relates to infractions and punishments.
Law 9,985	18-Jul-00	Establishes the National System of Nature Conservation Units (SNUC)
Decree 4,340	22-Aug-02	Regulates SNUC
Decree 5,758	13-Apr-06	Lays down the National Protected Area Strategic Plan
Decree 5,758	13-Apr-06	Lays down the National Protected Area Strategic Plan

SNUC suggests that states and municipalities should also set up their protected area systems and thus contribute to meeting biodiversity protection objectives and targets. The Government guarantees the protection of these areas by reinforcing their public nature; that is, they are areas that display social, cultural and economic relevance. Therefore, for an area to be recognized as a conservation unit, it must meet requirements such as natural relevance; official status and conservationist objective.

Thus, the specific objective of the SNUC Law was to establish criteria and standards for the establishment, implementation and management of CUs.

It is important to stress the management model of these units, which is vital for the development of protection of these areas. Knowing who the founder, or rather the creator of the area is, is also important to understand how it will be managed, that is to say, how the environmental assets will be managed. Since April 2007, management of these protected spaces in Brazil has been carried out by Chico Mendes Institute for Biodiversity Conservation (ICMbio), and no longer by the Brazilian Institute for the Environment and Natural Resources (IBAMA).

In Brazil, Conservation Units are divided into two groups:

1. Full Protective Units, which aim at preserving nature in areas with little or no human action, and where direct use of natural resources is not allowed. This group includes five categories: Ecological Station (ESEC); Biological Reserve (REBIO); National Park (PARNA) – which, when established by the state or municipality is called State Park or Municipal Natural Park –; Natural Monument (MN) and Wildlife Shelter (RVS).
2. Sustainable Use Units, which associate nature conservation with the “controlled use” of natural resources, include seven categories: Environmental Protection Areas (APA); Area of Relevant Ecological Interest (ARIE); National Forest (FLONA) (which, when established by the state or municipality are called State or Municipal Forest); Extractive Reserve (RESEX); Sustainable Development Reserve (RDS); Wildlife Reserve (REFAU), and Private Natural Heritage Reserve (RPPN). Tables 2 and 3 show the purpose of each category separately.

Table 2 Full Protection Units

Category	Objectives
Ecological Station (ESEC)	Prioritizes the preservation of nature and supports scientific research with the authorization of the body with jurisdiction; visitation is not allowed.
Biological Reserve (REBIO)	Full preservation of the biota and other natural attributes within its boundaries without direct human interference or environmental changes, except for measures to recover their altered ecosystems and the management actions required to restore and preserve the natural balance, biological diversity and natural ecological processes.

National Park (PARNA), State Park or Municipal Natural Park	Preservation of natural ecosystems of great ecological relevance and scenic beauty, allowing for scientific research and the development of environmental education and interpretation activities, recreation in contact with nature, and ecological tourism.
Natural Monument (MN)	Preserve rare, unique natural sites or those of a great scenic beauty.
Wildlife Shelter (RVS)	Protect natural environments where conditions for the existence or reproduction of species or communities of local flora and native or migratory fauna are assured.

Source: Based in Brasil (2000).

Table 3 Sustainable Use Units

Category	Objectives
Environmental Protection Area (APA)	Protect biological diversity, rule on the occupation process, and ensure the sustainable use of natural resources.
Relevant Ecological Interest Area (ARIE)	Maintain natural ecosystems of regional or local importance and regulate the permissible use of these areas to make them compatible with nature conservation objectives.
National Forest (FLONA), State or Municipal Forest	Multiple sustainable use of forest resources and scientific research, with an emphasis on methods for sustainable exploitation of native forests.
Extractive Reserve (RESEX)	Protect the livelihoods and culture of traditional extractive populations and ensure the sustainable use of the unit natural resources.
Sustainable Development Reserve (RDS)	Preserve nature and, at the same time, ensure the conditions and means necessary for the reproduction and improvement of the ways and quality of life of and the exploitation of natural resources by traditional populations, as well as enhance, conserve and improve the knowledge and environmental management techniques developed by these populations.
Wildlife Reserve (REFAU)	Maintain animal populations of land or water species, whether native or migratory, suitable for technical and scientific studies on the sustainable economic management of wildlife resources.
Private Natural Heritage Reserve (RPPN)	Conserve biological diversity.

Source: Based in Brasil (2000).

It is crucial to minutely plan which CU modality is best to implement according to the purpose for which a protected area is to be established. This will influence the decision for a more rigid or a more flexible modality in line with the ordinary view of sustainable development, also taking into account environmental services and disaster protection.

A preserved area cannot be established just for its own sake; it must be have a specific purposes, such as preserving watercourses, springs, in short, these territories need to be part of the country's environmental planning. For this, it is vital to have management and other plans that must be draft and applied systemically by the players involved in the protection, and the role of each one must be established, and also what can and cannot be done in the protected area.

Figure 1 shows that most CUs in Brazil, especially the larger ones, are located in the Northern Region, and are included in the sustainable use modality; that is, their legal regime is more flexible. This can be seen throughout Brazil, where most CU modalities are Environmental Protection Areas (EPAs), whose territories can be occupied; however, their protection must be agreed upon by the interested parties. According to Miara (2011, p. 56), planning is a complex theme that requires a degree of detail in order to create a CU:

[...] When planning and managing a CU, hydrographic systems should always be taken into account in the decision-making process. From the process of tracing the unit boundaries – which will subsequently influence the entire management process – to the definition of the unit zoning and the definition of its buffer area, it is necessary to consider the river basin as the primary unit for analysis and spatial planning.

In addition to the legal requirements provided for in SNUC, it is believed that the planning stage is crucial, especially when considering criteria for the implementation of a CU; these include hydrography is key and, as Miara (2011) points out, it is important to map the watersheds and land drainage using the management unit classified as a river basin as a benchmark.

3.2 Argentinian legislation on protected natural areas

In Argentina, according to the 1994 Constitution, natural resources are the domain of each of its 23 (twenty-three) provinces, which have powers to legislate on the subject; this includes protected areas, unlike the

Brazilian model, which establishes competition in drafting standards, for example. There is no such comprehensive national regulatory framework as the Brazilian National System of Conservation Units (SNUC). That is why each province has its own attributions in this field, which includes Protected Natural Areas (ANP), most of which have their own law; this, apparently, makes the model more complex for the management of protected environmental assets.

The exceptions are the national Protected Natural Areas, regulated by National Law 22,351/1980 for National Parks, Natural Monuments and National Reserves. These areas had their origins in the former national territories, and assignment of provincial laws in favor of the National State was established in the middle of the last century (like those of Patagonia). Subsequently, by a law from the National Congress, national parks, national reserves and natural monuments were established, whose regulation was set up by that law. Table 4 provides definitions of Protected Natural Areas in Argentina according to Law 22,351/1980.

Table 4 Definition of natural protected areas in Argentina

Protected Natural Areas	Definition	Objectives
Strict Nature Reserve or Scientific Reserve	They are rigorous natural areas with water or land ecosystems, and elements and/or species of flora and fauna of provincial scientific importance. These areas are perpetual.	Develop all processes without direct human interference, even when there are natural alteration phenomena, such as spontaneous fires and pest invasions, among others; exceptionally the Applicable Authority will determine the need for intervention when technical studies so advise.
Provincial Parks	Provincial parks are ecosystems with biogeographic significant, little altered by human activity or occupation and that contain species of flora and fauna, geomorphological sites and/or landscapes of scientific educational, and recreational interest.	Aim at few natural alterations in the Ecosystems. Encourage scientific, educational and recreational interest.
Natural Monuments	These are natural biological and environmental areas and archaeological and paleontological sites of a relevant and unique scientific, aesthetic or cultural interest, to which absolute protection is granted.	Ensure the principle of absolute intangibility. Conduct activities, workshops, and scientific research allowed by the Execution Authority in relation to the conservation objectives established for the case.

Managed Natural Reserve	These are areas intended at preserving Specific places or habitats that are indispensable to maintain the existence of populations of species that are important to the conservation or sustainable use of local groups.	Seek for and apply types of environment handling in order to create better living conditions for the species or the community that is the focus of conservation, without prejudice to the elements of the privileged ecosystem in the reserve establishment objectives, whenever possible.
Protected Landscape	Protected landscapes are natural or semi-natural environments with cultural values worthy of being preserved in their traditional or current state, provided they are not purely urban.	Implement and take all required measures to maintain the quality of the landscape by means of adequate management practices.
Cultural Natural Reserves	Cultural natural reserves are areas inhabited by traditional societies interested in preserving their own cultural patterns and whose harmonious relationship with the environment must be ensured, and also those that display anthropological and/or historical values for scientific or educational purposes.	Preserve their own cultural patterns and keep a harmonious relation with the environment.
Multiple-Use Private Reserves	These are those displaying a certain level of transformation in their natural condition, maintaining an ecological system in a dynamic balance. Production activities may be carried out in these natural	Preserve the balance of their environments by means of the regulated use of their resources reserves, without prejudice to their characteristics, ecological status, the specifics of wildlife, and the potential of their production sources.
Water Reserves - Wet plains	They are hares with watersheds or water reservoirs inserted into wild environments, which are either considered as of ecological and touristic importance and/or yet to be declared as such.	Natural reserves aim at conserving the best conditions of their major natural characteristics.

Source: based on Law 22,351.

From this systematization of definitions and objectives, it is clear that Law 22,351 of 1980 did not lay down criteria, modalities, or powers for an interaction or collaboration with the provincial bodies with jurisdiction on the matter, or the possibility of the execution of agreements. According to Beccaceci (1992), over the years, the criteria and possibilities for the creation of Protected Natural Areas (PNAs) in Argentina have been assessed based on the changes in the evolution of conservation and protection concepts, also taking into account the territory and its specificities, like fauna, flora, soil, management etc.

Both in Brazil and Argentina, there is a need for Integrated Territorial Management. This becomes more important to the extent that there are considerable environmental changes in the future of the planet, thus increasing the need for considering territorial management based on environmental rationality, so as to think the urban space in harmony with the surrounding environment, blending nature and concrete, thinking about drainage areas, preserving water sources, vacating permanent preservation areas, river banks, hills, in short, with the possibility extreme events such as rain and hurricanes looming in the horizon, planning becomes essential for saving lives. As stated by Sulaiman and Aledo (2016), it is essential to think about risk management, and this management has to be integrated and full, that is, there should be no separation between nature and urban planning, for example.

Therefore, following Carvalho (2015a), in the case of Brazil, it is imperative to stress that, in terms of territorial management, the basic instrument is the master plan, which will regulate the use and occupation of the soil at the municipal level; this must be in line with the National Environmental Policy, the National Basic Sanitation Policy and the National Water Resources Policy, just to mention some examples. Thus Carvalho (2015a, p. 45) states:

Because floods and landslides are the most frequent and catastrophic events, there has been a notion in Brazil that the handling of these disasters can best be addressed by land-use strategies such as Master Plans, which are of a fundamental legislation kind.

However, it is important to stress that the literature treats conservation units only as environmental protection, as a genetic banks, whereas this article moves the analysis forward by envisioning a new crisis situation resulting largely from human action, where these protected areas be part of the urban disaster planning, either around or even within cities.

4 THE SANTA FÉ CASE

According to Instituto Provincial de Estadística y Censos, the province of Santa Fé is located in the center of the Argentine Republic, with an area of 132,638 Km² divided into 19 departments (the departments have a statistical, electoral and organizational function for provincial-level agencies, like the police, for instance), with a population of 3,200,736 inhabitants (2010 Census), which places it in third place in terms of number of inhabitants in the country, after Buenos Aires and Córdoba. Santa Fé is

one of the first cities founded in the country and has a rich cultural diversity that is reflected in its buildings, museums, churches and houses.

In the provincial capital, there is a set of scientific and university institutions that allow it to be defined as a center for production of knowledge and research. In addition, that region is marked by the presence of value chains, numerous services and a growing tourism industry. According to the *sistema de información de biodiversidad* (biodiversity information system), two environmental zones are recognized in this region: the west zone, a more Mediterranean area, and the east zone, characterized by an environment full of islands and streams in permanent change, which houses a wealth of very varied flora and fauna.

In addition, the environmental context is one of the main aspects of the region, and there is a strong link between the territory, the citizens and the way initiatives and activities related to its environment are developed. The province has a territorial planning, which, due to the historical threats of the floods, was established to improve protection measures. These actions are developed considering spaces of participation, where all players involved in the issue reach a consensus.

Costanera Este Ciudad Universitaria Ecological Reserve, Ciudad de Santa Fé, was established in April 1988 on lands under federal jurisdiction belonging to the Universidad Nacional Del Litoral (UNL), with the aim of preserving a representative sample of the Paraná River flood valley, near the urban environment of the city of Santa Fé. This reserve is between UNL and Habitat and Development Foundation (Strategic Agreement of Universidad Nacional del Costeiro, Council Resolution 672/1998), which is responsible for its management and financial maintenance.

The space where Costanera Este Ciudad Universitaria Ecological Reserve is located was granted by the municipality of Santa Fé in November 1963 for the construction of the university city. From then on, what was known as “El Pozo Park” was partially filled, and only in June 1964, *Universidad Nacional del Litoral* effectively took over the 43-hectare property. In 1973, the land was registered, as 20 thousand m² were granted for the construction of what is currently called *Costanera Este*.

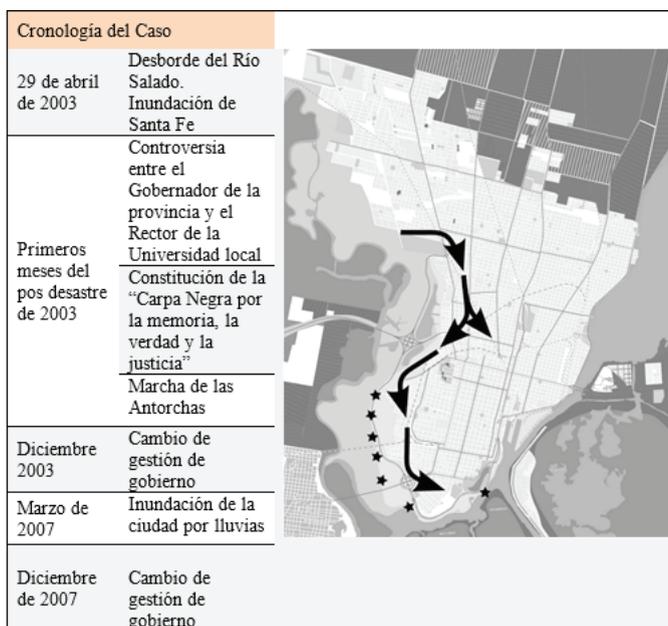


Figure 3 Satellite view of Ciudad de Santa Fé and the conservation unit.

Source: Adapted from NASA (2004).

It is located in the “El Pozo” area, north of the university city, next to the so-called “UNL-ATE building”. The main entrance to the protected area is located on the city’s *Costanera Este* Avenue. It is very easy to access by different means, including some urban transportation lines. The protected area is a concave and relatively isodiametric space with a discontinuous perimeter and, some isolated areas within it. In its central area, as is usual in this type of island environment, there is a lagoon of semi-permanent water. It is an extremely important urban preservation region for local ecosystems, mainly because it helps to promote the balance between soil and water; together with La Plata River and the lakes, it makes up an ecological system that helps preserve the riverbanks and life in the city.

In Figure 3, in the second right, you can see the path taken by Salado River in the 2003 disaster, a large flood that left thousands of people homeless, aggravated by a lack of urban and environmental planning (BELTRAMINO; FILIPPON, 2017). Figure 4 reinforces the complexity of urban planning in Santa Fé.

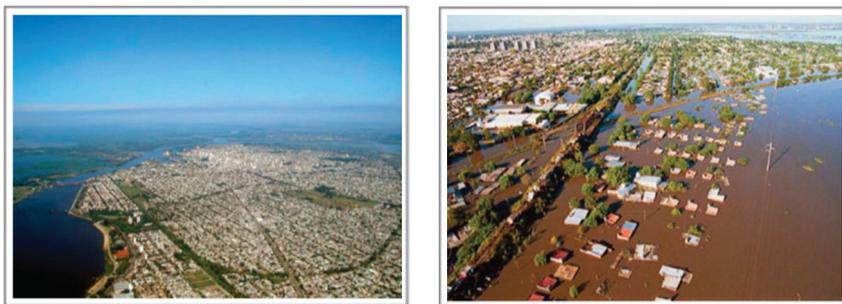


Figure 4 Aerial photo of Santa Fé, Argentina.

Source: Gobierno de la ciudad de Santa Fé (2013).

The protected area includes species such as cockspur choral tree (*Erythrina crista-galli*), Humboldt’s willow (*Salix humboldtiana*), kurupi (*Sapium haematospermum*) and river alder (*Tessaria integrifolia*), forming forests belonging to the phytogeographic district of Espinero jungles, a phytogeographic province of the Paraná River, with species that come down along the jungle galleries bordering that river. Costanera Este Ecological Reserve is the only reserve in the province of Santa Fe, from its inception to the present day. Table 5 gives an overview of the management structure of this conservation unit.

Table 5 Physical structure and bodies with jurisdiction of the ecological reserve

Preserved Natural Area	Physical structure	Organs Responsible	Possession and ownership	Management plan
Costanera Este Ecological Reserve	It has a physical infrastructure to provide support to employees, collaborators and volunteers who are daily present in the environment. It has a small museum with exhibits on the history of the reserve. There are benches and tables scattered throughout the Reserve for the use of visitors; these are made of recycled materials, thus helping protect the environment from any damage.	Universidad Nacional del Litoral Fundación Hábitat y Desarrollo	Public-Private	Yes

Source: Prepared by the author (2017).

Studies already conducted there (MOREA, 2014) point to a general deficiency in the management of these preserved areas in Argentina, as they lack financial support, basic infrastructure and supervision, and their effectiveness will often depend on where they have been deployed. In addition, it also seems relevant to analyze whether protection has been efficient (ETCHEPARE et al., 2017) by checking the objective(s) for the area and whether they are being met in terms of preservation of terrestrial, marine, and lake animal and plant species in rivers and also river springs, surface waters and aquifers.

This process that took place in Santa Fé indicates the need for designing resilient city models (ONU, 2012), including planning integrated with environmental protection, whose main policy is that of protected areas. The protection of ecosystems is also one of the disaster prevention steps set by the United Nations (ONU, 2012). Coutinho (2014, p. 7) points out with precision the importance of strengthening policies that can add to the proposal of cities capable of resisting the impacts of environmental changes:

To prevent disasters, government action is needed through measures that enable social inclusion, education, security, stimulus to community participation, building of suitable housing away from risk areas, and public policies that encourage the

strengthening of local capacities to cope with disaster-related problems, thus creating resilient communities.

This corroborates the idea that disasters are not that natural. There may be inflection points, such as climate changes; however, it is believed that public management actions and omissions are responsible for much of the effects of these extreme events. Carvalho (2015b) points out that the protection of ecosystems is not restricted to the protection of living beings from most immediate human actions, such as vegetation cleaning fires, shedding or deforestation, but can serve as a prevention against risks of disasters that threaten all forms of life. This is corroborated by a study from Partnership for Environment and Disaster Risk Reduction (PEDRR, 2010) that claims that ecosystems (such as wetlands, forests and coastal systems) can reduce physical exposure to natural hazards by serving as natural protective barriers or buffers capable of mitigating impacts.

Therefore, the insertion of risks in territorial planning is essential. The National Government of Argentina launched in 2018 the *Plan Nacional para la Rucción del Riesgo de Desastres* (PNRRD, 2018) (National Plan for Disaster Risk Management), whose text makes clear that risk prevention planning includes protection of ecosystems based on territorial integration. Baas et al. (2009), in a document from the United Nations' Food and Agriculture Organization (FAO) proposed a methodological roadmap for assessing progresses in risk prevention in several countries, with nature and environmental protection being key factors in preventing risks, and/or lessening their consequences. UNDP (2014) had already pointed out that the destruction of nature is one of the causes of disasters, besides increasing their effects.

Therefore, the case of Santa Fé is exemplary, since there was a redirection of territorial management in order to add environmental protection to urban planning. The city of Santa Fe created a Municipal System of Preserved Areas by means of Law 12,025/2013, which aimed at establishing public spaces that would increase the green area of the city and help in the storage of water and the reduction of the possibility of floods (GOBIERNO DE LA CIUDAD DE SANTA FE, 2013). The System of Protected Natural Areas established by the aforementioned law is considered as:

Art. 2. A los efectos de la presente se considera Área Natural Protegida a todo ambiente o territorio sobre los que, por razones científicas, económicas, históricas, patrimoniales, culturales, ambientales o de seguridad para la comunidad se considere

necesario aplicar acciones tendientes a preservar el sistema natural y estén orientadas a mejorar la calidad de vida humana y por lo tanto estarán sujetas a un manejo legal especial que deberá establecer el Departamento Ejecutivo Municipal. Dicho manejo necesariamente debe contemplar las preexistencias sociales que impliquen procesos identitarios sobre los territorios, incorporándolos en las políticas estatales de protección propuestas. (For the present purposes, a Protected Natural Area is considered as any environment or territory to which, for scientific, economic, historical, heritage, cultural, environmental or safety reasons for the community, it is considered necessary to apply actions aimed at preserving the natural system and that are geared at improving the quality of human life, and therefore will be subject to special legal management to be laid down by the Municipal Executive Department. Such management must necessarily contemplate social preexisting conditions that imply in identity processes over the territories, incorporating them into the proposed state protection policies.)

The municipal law that formed the local environmental protection system in Santa Fé includes as an essential objective the improvement of the quality of life of the population. Moreover, in Art. 3 of the same law, risk prevention and territorial management are already mentioned as objectives of that policy.

Art. 3 [...] d) Prevenir situaciones de riesgo que involucren a poblaciones garantizando el respeto hacia la identidad e historia de los barrios que queden involucrados en la presente Ordenanza; [...] e) Definir herramientas de planificación participativa ciudadana para la gestión del territorio que garanticen la sostenibilidad de las propuestas y definan prioridades en la toma de decisiones. (Prevent risk situations involving public populations by guaranteeing the respective identity and history of the districts that have been involved in the present Ordinance; [...] e) Define tools of participatory city planning for the management of the territory, capable of ensuring the sustainability of the proposals and the definition of priorities in decision-making. [...])

However, it is possible to find charges filed in the Province of Santa Fé indicating that recurrent flooding has been caused by the strong process of replacing forests by planting soybeans in large areas (CASTRO, 2016). Hence the need for a strong, strategic environmental protection policy geared toward disaster prevention, not with a purely protectionist goal, but in pursuit of survival.

Lara (2004/2005), when investigating the causes of constant flooding in the Santa Fé Region, points out the neglect of public management, as well as the development model adopted as the main causes. In fact, during public planning the close interconnection of development and disasters is not clear; this can give rise to local, regional and national plans that do not address the problem in a multilateral manner.

5 THE FLORIANÓPOLIS CASE

The city of Florianópolis, capital of the Santa Catarina State, is an important case to reflect about management of conservation units in Brazil and their function beyond the protection of nature, since it is a tourist city, a large urban center located between rivers and the sea, with several rocky formations, thus presenting a great possibility for disasters that can be worsened by the impending reality of climate changes.

As in Santa Fé, there is an intrinsic need for greater protection, given the high level of urbanization and the existence of rivers and lakes that reinforce the need for special care regarding flooding in the region. Clearly, the conservation of vegetated swaths of land and a whole system of interconnected ecosystems strengthens the protection of nature itself and acts as a kind of “safety pocket” against erosion and flooding in urban centers, especially those with the most vulnerable populations. Figure 5 shows a view of the north and south of Santa Catarina Island, where Florianópolis is located; it is possible to see the complexity of planning and the need for environmental protection.



Figure 5 Florianópolis Island. Source: Personal collection.

It is argued that conservation units and the preservation of strategic areas, such as Santa Fé and Florianópolis, provide far more than environmental protection³: they provide water, ecological and urban security; that is, there is a protection and prevention system in place in urban planning that can be adopted with solutions based on nature itself. The implementation of urban centers needs to be based on a broad urban and environmental planning in order to avoid disasters. Figure 6 shows the set of conservation units along the island that cover a large part of the city of Florianópolis.

³ It is important to understand that this expression is broader than it seems, and also includes urban planning.

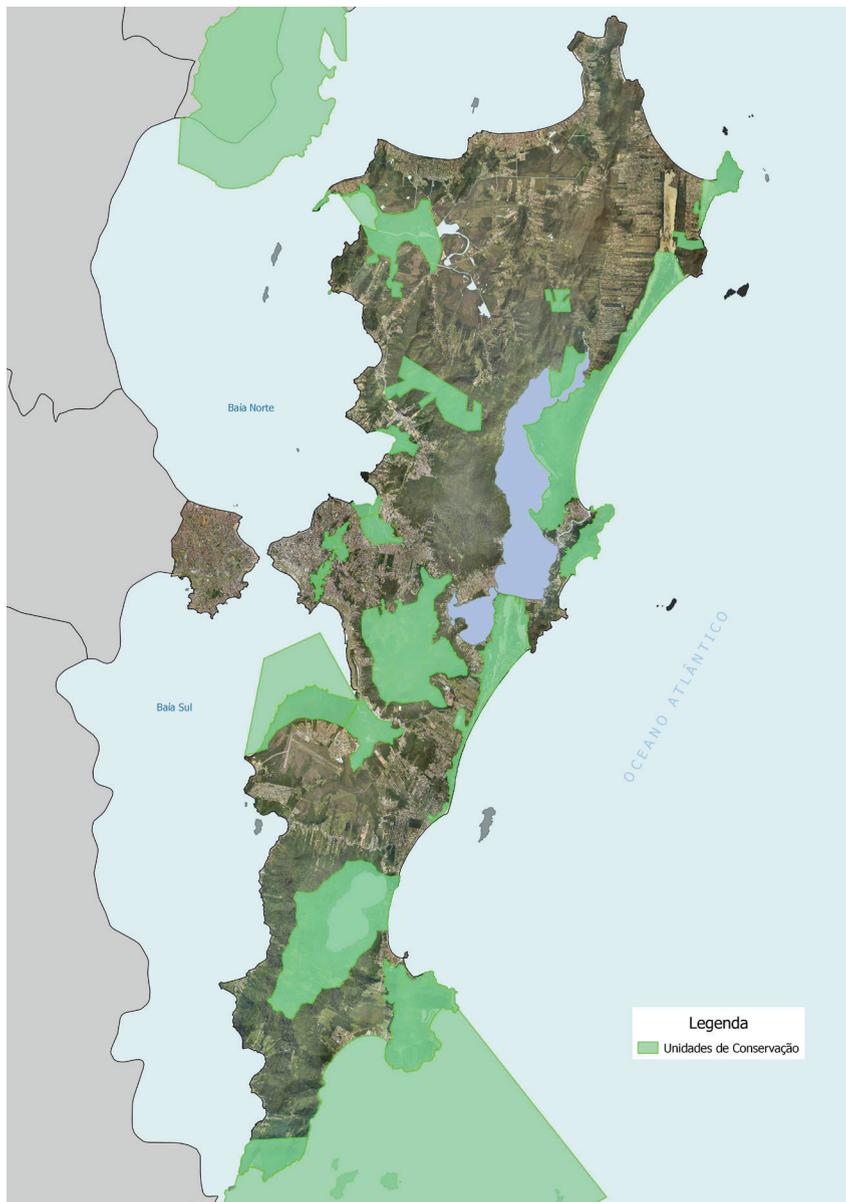


Figure 6 Conservation units in Florianópolis Island.

Source: Florianópolis (2019).

It is important to overlap this map of the island's conservation units with the mapping of disaster-prone areas already monitored by the authorities. Figure 7 can help in this regard.

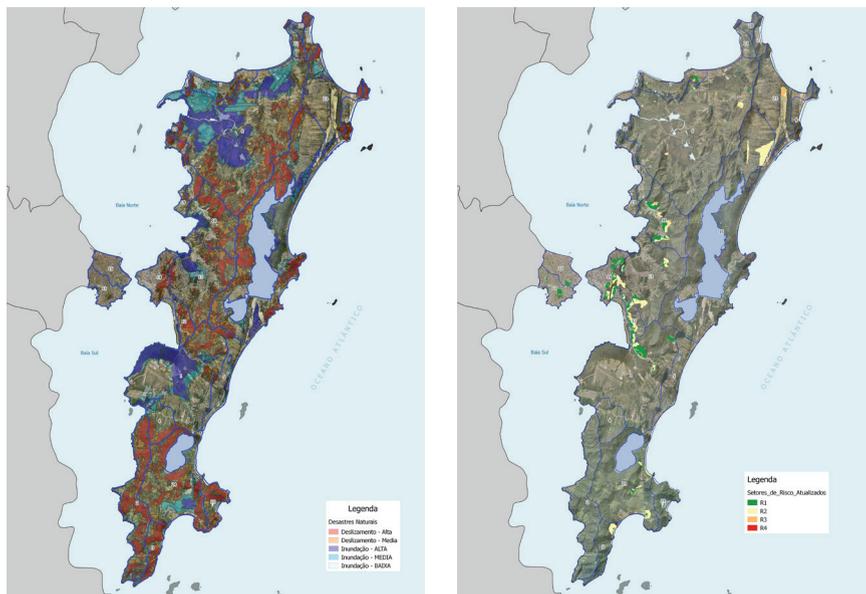


Figure 7 Island Florianópolis disaster map.

Source: Florianópolis (2019).

Figure 7 combines two versions provided by the City Hall and shows, on the left, the risk areas in terms of floods and landslides and, on the right, new risk areas in the region. This is an inseparable part of the urban planning, as it is necessary to provide for the possibility of disasters, as well as to guide land use and occupation in an orderly manner.

Therefore, by looking at these overlapping maps, it is possible to understand the relevance of environmental protection in risky areas, and the urbanization process in Brazil does not help to avoid disasters such as landslides and flooding, as it depends on several socioeconomic and environmental variables, such as the increasing degree of soil waterproofing in urban centers, the absence of an efficient drainage system, and the irregular occupation of the soil by constructions along hillside, which are extremely helpful in causing those problems.

Disaster protection, the formation of areas that can be used as large territories that can be flooded to ensure protection to people, whether in

the rural or urban environment, is a key measure of the disaster prevention process. However, Law 9,985/2000, which established the National System of Conservation Units, is full of gaps, and disaster prevention is not among the objectives of these areas.

Even with this lack in the legal text, it is important, as an urban planning action, to establish a scale of protection for certain risk areas throughout the island territory, based on the modalities of protected areas already established by law, by avoiding irregular occupation by residential, commercial or industrial buildings. Protected areas need to be created on the basis of *de facto* and direct integrated planning, i.e. establishing an obligation is not enough: implementation and monitoring are required.

The Master Plan of municipalities (CARVALHO, 2015a; 2015b), which is mandatory for those with more than 20 thousand inhabitants, needs to include environmental variables in its scope that are in line with the use and occupation of the soil, following the legal regime conferred by laws to these areas 21 and creating, other protected areas by means of municipal laws. It is important to highlight the need for a thorough knowledge of the territory, which can be helped by mapping it.

Disaster planning should include a systemic analysis of relevant factors such as sanitation, including access to water, treated sewage, drainage and proper waste disposal, a soil waterproofing control program, preservation of springs, tight control of hillside occupation, and control of occupation of permanent preservation areas, all this being associated with the preservation of nature. Therefore, the outlook must be an integrated and systemic one.

The Master Plan of the city of Florianópolis, created by Complementary Law 482/2014, aims at directing this integrated and systemic outlook at urban planning, including preservation of nature (soil, air, water, vegetation and fauna) in an articulated way with constructions in general, with tourism, with occupation of a rural nature, the preservation of watersheds – including ground waters – and prevention of disasters such as pollution, flooding, and landslides, among others (FLORIANÓPOLIS, 2014a). Figure 8 shows the complex dimension of planning on the island of Florianópolis, whose zoning is based on the current Master Plan.

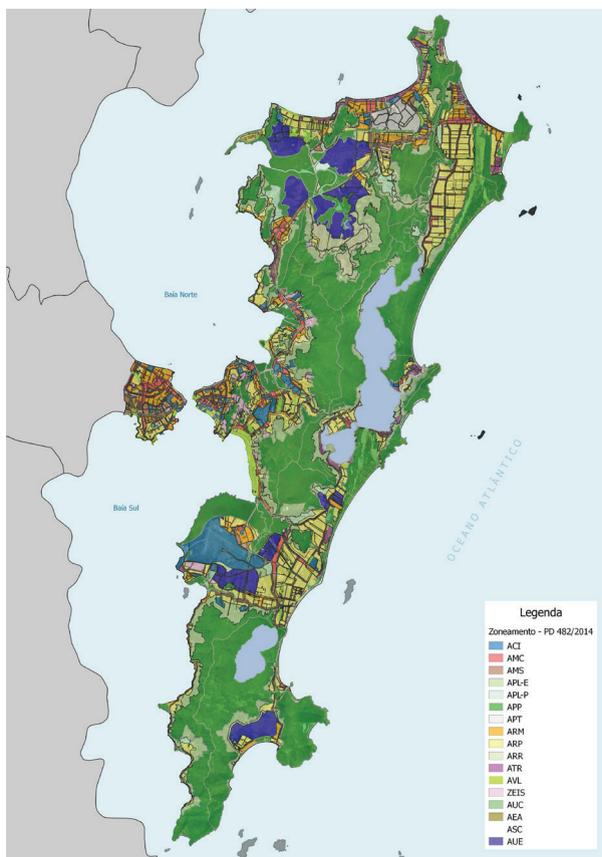


Figure 8 Florianópolis Island zoning based on the Master Plan.

Source: Florianópolis (2019).

It is necessary to highlight in Figure 8 some areas that are predominant in this territory, such as Permanent Residential Areas (ARP) – in light yellow –, which should be the object of a more accurate planning for the protection of their inhabitants, in association with Figure 7, the risk area one; Permanent Preservation Areas (APPs) – in dark green – are another urban concern of Florianópolis, as they predominate is the characteristic ecosystem of the Island. Figure 9 shows an area where legal compliance is not respected; this causes an increase in the potential for social and environmental vulnerability due to human action and that, combined with the effects of climate change, will result in potential disasters.



Figure 9 Morro da Cruz region in Florianópolis, with irregular occupation.

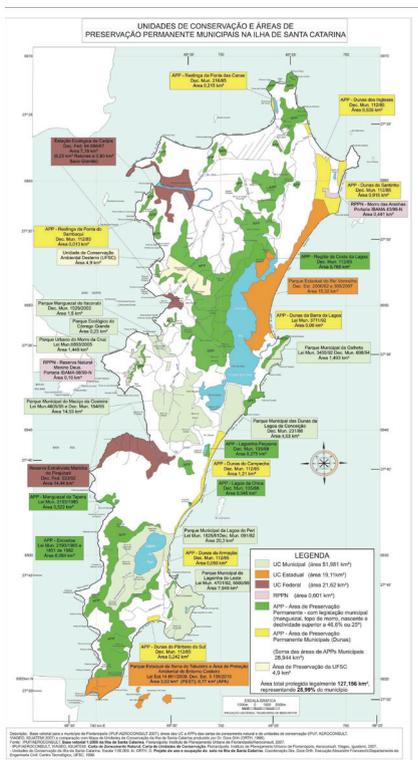
Source: Florianópolis (2014b).

Figure 10, provided by the Environmental Education Center of Federal University of Santa Catarina (NEAMBI), shows the existing federal, state and municipal protection network on the island, with its levels of protection based on the SNUC classification; it is possible to overlap the map shown in this figure with the others presented in this article.

Figure 10 Florianópolis Island conservation unit grid.

Source: NEAmb (s.d).

Regarding the legal regimes provided for in the SNUC law, at the time of its zoning, the Florianópolis Master Plan



(PDF) laid down Environmental Limitation Areas (ALA)⁴, which make intervention more flexible, but determines a certain level of environmental protection, unlike APAs, as they do not have absolute protection. Figure 11 shows these areas for comparison purposes with the other maps.

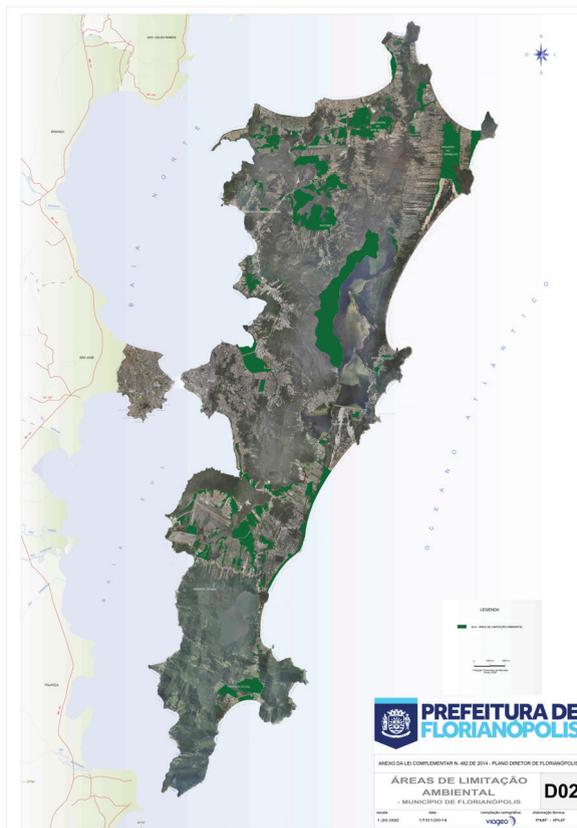


Figure 11 Environmental Limitation Areas (ALA).

Source: Florianópolis (2014c).

This is yet another variable in an integrated and systemic legal analysis of urban planning standards, including, of course, environmental standards. This is not such a new issue: by consulting Eco-92 held in Rio de Janeiro, specifically Agenda 21 – the final document of that meeting –

⁴ These are territorial spaces whose natural characteristics are incompatible with urban occupation, but which do not require absolute protection. Naturally-occurring places are allowed in these areas, whose environmental characteristics are a limitation to urban occupation, as that must be respected. Unlike in permanent preservation areas, vegetation may be suppressed in the form and within the limits laid down by the specific environmental legislation (Art. 140, PDF).

we can see that urban planning, combined with environmental protection, are important elements for achieving quality of life, whose scope is very broad in environmental matters, in view of the directives of Art. 225 of the 1988 Federal Constitution. According to Albano et al. (2015), this integrated planning is essential for disaster prevention. Mello-Théry and Ramires (2018, p. 10) take the following standing:

[...] the outcome of the Rio +20 Conference, of which we highlight the document called “O futuro que queremos” (“The Future We Want”), acknowledged that cities can lead the way for urban areas to be economically, socially and environmentally sustainable, provided urban planning is conceived in a holistic way, imparting to the citizens the co-responsibility for facing the challenges of that policy.

The point is that even today it is possible to perceive a linear thinking that runs through

public management, so that it is not possible for the various areas and attributions to talk together, especially when it comes to issues classified as environmental, which they still insist are separate from other areas, such as health, urban cleaning, sanitation, and education. In short, it is necessary to break administrative taboos in this field. The study by Rizzo and Rodrigues (2014) confirms what we said; however, when applied to Florianópolis and its Metropolitan Region, we see a disordered growth, which puts pressure on both APPs and CUs, thus making public interest in disaster prevention secondary and a hostage to the private interests of real estate speculation.

FINAL CONSIDERATIONS

Comparative studies pose challenges. However, it is possible to better understand a reality through this research exercise. Urban planning is essential for environmental protection and vice versa, and both are part of the risk prevention process that can help with disasters. However, environmental protection stands out as a more complete and complex process that encompasses both planning and disaster prevention methodologies. In fact, the most feasible way to address the problems we are faced with and those to come is by means of a holistic understanding of these processes. We are moving toward the prominence of a Disaster Law closely related to Ecological Law.

Both cases discussed here show that countries have robust and enforceable legal instruments to provide society with an environmental

protection policy in line with risk prevention and risk management. However, it seems that in both Argentina and Brazil there are obstacles to their implementation. In the case of Brazil, it is possible to see that environmental policy may not be treated as something that permeates all sectors of the state, as it is considered rather as a set of instruments limiting development. The old dichotomy between development and environmental preservation still persists. It is possible to say that the answer to the problem lies precisely in this polarization, where there is no planning and there is no attempt to solve problems when they appear, which is not always possible in view of the increasing frequency of extreme events. Therefore, it is plausible to say, based on this view, that disasters are not so natural, but preceded by a lack of planning and planning mistakes; that is, what is public management or lack of public management is not really understood.

We dealt here with the social and environmental protection in cities, looking to the case of Santa Fé, Argentina, and Florianópolis, Brazil, both important urban centers that are inserted in an ecosystem that presents a higher degree of social and environmental concerns and vulnerability, that is, they require a “view” that, in planning, should take elements intrinsic to both nature and populations into account. This is the fundamental point, the need to plan land use in a broader way that includes a social and environmental vision. This implies taking into account the political, social, economic, cultural and nature aspects, that is, an integrative, complex and holistic view.

Thus, we cannot yet find a consolidation in the field of law capable of producing an amalgam between urban planning, environmental protection and disasters. This field is fundamental for facing climate dilemmas that are beginning to appear in courts in various parts of the planet. Another issue that draws attention to this approach is the importance of mapping associated with an analysis of compliance with standards related to Master Plans, an essential normative tool for thinking about social and environmental planning and moving forward into a new area of knowledge, GeoLaw, combining knowledge of Geomatics⁵ and Law; this can make decision-makers considerably less unsure when applying standards.

It is important to note that it is necessary to take into account that there is already a roadmap for risk and disaster prevention. This is the Sendai Framework for Disaster Risk Reduction, which was approved in 2015 in Japan. It includes guidelines for establishing a disaster risk prevention and

⁵ It is a field of activity which, by means of a systematic approach, integrates all means used for the acquisition and management of spatial data required as part of scientific operations.

disasters risk diagnoses from 2015 to 2030 (ONU, 2015). However, despite all those already mentioned here, we believe the training of a specialized workforce is a greater challenge, since what we see is municipalities and states, and even at the federal government level is that public agents capable of understanding and carrying out plans aimed at anticipating risks and disasters, as well as mitigating their effects, are either lacking or unprepared. Therefore, far beyond a prominent legal framework, we need a public administration prepared for these challenges. Having the sufficient budget is not always a solution to the problems, since without trained and valued professionals, the plans are not implemented.

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