

# Environmental Public Policies in Coastal Ponds: The Case of Náutico Lagoon – Pernambuco/ Brazil

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***Abstract**– In the current context, coastal lagoons are ecosystems that suffer major anthropic interference and, in the case of Náutico Lagoon, central focus of this research, these impacts are noticeable, mainly, with the presence of several communities that formed around them and that along of the years have been consolidated. In view of this problem, the present work aims to discuss the current environmental public policies for Náutico Lagoon. Even with so many legal parameters, it is still difficult to implement environmental education policies in Brazil. With this research it was possible to conclude that this lagoon system is in a situation of abandonment and negligence by public agencies, requiring investments and environmental public policies that seek to efficiently develop and structure this environment, highlighting potentialities such as ecological and landscape diversity, tourism and leisure for the population.*

***Keywords**— Environmental degradation; Coastal Pond; Environmental Public Policies.*

## I. INTRODUCTION

The municipality of Jaboatão dos Guararapes opens a coastal lagoon called Náutico Lagoon (Nautical Lagoon), formerly known as Olho D'água Lagoon (Spring Lagoon). According to Assis (1997), coastal lagoons are ecosystems that suffer major anthropic interference and, in the case of Náutico Lagoon, focus of this research, which is inserted in the urban environment, these interferences are noticeable mainly for being inserted in an urban perimeter and in the presence of several communities that have formed around it and that over the years have been consolidated.

Given the importance of environmental conservation of coastal lagoons and compliance with current legislation, actions aimed at protecting these ecosystems need to be widely disseminated, inspected and debated. According to Leal (2002), coastal lagoons exert a direct influence on the maintenance of the groundwater and on the stability of the local and regional climate. Therefore, the importance of Náutico Lagoon for the municipality of Jaboatão is enormous with respect to local climate issues and biological maintenance for the urban environment.

With this problem in mind, this article has the main objective of discussing public environmental policies in

coastal lagoons, and the specific objectives of: debating public environmental policies for Náutico Lagoon supported by the current legislation and to discuss the issue of environmental degradation in this ecosystem. The research has a qualitative character, desk research on the theme were used as methodological bases, with documentary research and on-site visit to the study area in addition to the current legislative mechanisms for this environment.

There exist several instruments and environmental policies aimed at the conservation of natural environments, especially the hydric ones, as a means of guaranteeing their environmental sustainability (BRAGA, 2009). Nevertheless, even with so many legal parameters, the implementation of environmental education policies in Brazil is still difficult. Many laws, decrees and ordinances are not effectively put into practice, often lacking greater commitment from both society and government with respect to environmental issues and compliance with legislation through actions aimed at protecting these ecosystems.

With this study, it was possible to conclude that this lagoon system is in a situation of abandonment and

negligence by public agencies, in need of investments, environmental education projects and public policies that seek to develop this space efficiently and in a structured manner, highlighting both the potentialities, such as an ecological and landscape diversity which set it as a social and tourist asset, and the harmful relationship between the natural ecosystem and local population.

## II. THEORETICAL BASIS

### 2.1 Environmental Public Policies – EPP

According to Salheb et al. (2009, p. 06): "The environmental crisis caused society to mobilize, demanding - from the constituted powers - mitigating and propelling responses to a new societal model". This need promoted the emergence of environmental policies in Brazil and Environmental Public Policies gained strength from the second half of the twentieth century. Over the years, the concern with the possible scarcity of environmental resources impelled Brazil to create, on August 31, 1981, Federal Law No. 6,938 referring to the National Environment Policy (PNMA, Política Nacional do Meio Ambiente in Portuguese), which has as its main focus the environmental preservation, improvement and recovery (MOTTA; PÊGO, 2013).

According to Law No. 6,938 / 81, the PNMA, which comprises of 21 articles, is the Brazilian most important reference regarding environmental protection, where each one of its articles addresses diverse aspects related to the environment and its protection mechanisms. Within that law are the concepts of environment, environmental degradation, pollution, among other themes, taking Brazilian reality into account.

In PNMA, the principles are responsible for regulating and directing actions, the instruments are the tools for the environment preservation and the National Environment System is the set that comprehends the Union, agencies and entities in the federal, state and municipal spheres that work in cooperation to enhance environmental quality and preservation (RODRIGUES, 2010).

#### 2.1.1 Environmental Education

In 1972, the United Nations (UN) held the United Nations Conference on the Human Environment, also known as the Stockholm Conference, which was characterized as the initial step towards debates on the environment. According to Costa (2012), the conference addressed a series of concerns relative to the well-being of society and future generations, such as climate change, which was already being perceived, the heat islands, water management and quality, limitation with regard to the use

of pesticides, the release of heavy materials into nature, among others.

After this conference a series of debates were launched with a focus on environmental preservation, among them is the United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit, Rio Conference, or Rio 92 (in Portuguese, ECO 92) that was held in Brazil, more specifically in Rio de Janeiro. According to Novaes (1992), this conference, as well as the Stockholm one, aimed to reconcile the issue of social and economic development with the environment, promoting sustainability and reducing impacts on the natural environment.

Rio 92 took place 20 years after the Stockholm Conference and addressed more concise debates on the notion of the term sustainable, aiming at a less consumerist growth model, having as its motto the phrase: "think globally, act locally".

The first conference on Environmental Education was held in Yugoslavia (Belgrade Conference) in 1975 and was linked to the Stockholm Conference. Within the Belgrade Conference, principles and guidelines for environmental education were created, accounting for multidisciplinary and regional disparities based on national interest.

Also in this conference, the Belgrade Charter was formulated, which, according to Reis (2014), asked humanity to rethink the concept of development, where individuals should reconcile their priorities, strengthening the commitment between the environment and society. The second meeting was marked by the Intergovernmental Conference in Tbilisi, initiating, according to UNESCO (1997), the International Environmental Education Program (IEEP), taking into account the interests of the Member States.

The Tbilisi Conference summoned educational authorities to encourage institutions to develop the work of reflection, research and innovation in the environmental education knowledge field, including the Member States in this debate, in order to encourage the exchange of experiences, research, reports and documentation for environmental education to obtain a global focus and an interdisciplinary character. Finally, the third conference, according to Moradillo and Oki (2004, p. 333) "[...], stood out from the others for creating a theoretical and methodological framework for the realization of Environmental Education".

When approaching environmental education, there exists a variety of concepts and definitions converging to the same purpose: encompassing man, nature and all the paths that

lead to an awareness aiming at the preservation of the natural environment.

According to Law No. 9,795 of April 27, 1999, Environmental Education is characterized by:

Art 1 “[...] the processes through which the individual and the collectivity build social values, knowledge, skills, attitudes and competences aimed at the conservation of the environment, a common use good of the people, essential to the healthy quality of life and its sustainability”(PNEA, 1999, p.1).

According to Dias (1998), the concept of Environmental Education is defined as a set of environmental content and practices aimed at solving concrete environmental problems, by means of an interdisciplinary approach and an active and responsible participation of human being as a society.

Education in general, presents itself as an important instrument that contributes to the development of the nation, in addition to being responsible for the evolution of man within society. Discussing environmental education in the academic sphere, in the school environment and in other social areas contributes to spread the importance of research in this area of knowledge and foster the search for solutions that aim to mitigate the degradation of the environment by man, being of paramount importance to propagate the need for the maintenance and preservation of the natural environment as well as the guarantee of better living conditions for future generations (ZULAUF, 2000).

According to IBAMA (1997), Environmental Education, in relation to its character and function, is responsibility of the whole society and must address all members of the community according to the modalities that meet the needs, interests and motivations of all age groups and socio-professional categories.

## 2.2 Coastal Lagoons

According to Esteves (1998), in Brazil, coastal lagoons are present in abundance in the territory, ranging from small depressions that are formed by the accumulation of rain or sea water, to perennial water bodies with a large volume of water. Thus, Leal (2002) adds that coastal lagoons directly influence the maintenance of the groundwater and the stabilization of the local and regional climate.

This type of ecosystem, despite suffering from anthropogenic pressures, offers important environmental services, among them the regulation of the surrounding temperature and water balance, since they serve to increase the water surplus of canals during periods of intense rain.

Leal (2002), remarks that environmental impacts often result in irreversible ecological degradation of coastal lagoons, making the ecosystem unfeasible for any use and, linked to these impacts, is the landscape degradation of adjacent areas, due to real estate occupation in the lagoons flood zone, which indirectly increases the pressure on the main lagoon. Corroborating this problem, Nascimento (2010, p.28) adds that:

Most of the times it is in the metropolitan regions that rivers, lakes and lagoons are landed with solid waste and garbage. Many have their banks invaded by dwellings without any sanitation infrastructure, so the waste produced is dumped into the bed of these bodies, causing thus various forms of environmental degradation.

In this sense, coastal lagoons are extremely fragile ecosystems that need efficient environmental public policies aimed at their protection and maintenance. According to Santos et. al. (2015), these ecosystems are classified among the most threatened worldwide, and this happens mainly due to the geographic factor of location, because it coincides with regions of great occupation and urbanization, rendering these environments subject to anthropic interference.

### 2.2.1 Municipal Master Plan

With regard to the Municipal Master Plan (Plano Diretor Municipal in Portuguese, or PDM), it is necessary to establish a direct relationship with municipal planning, which are tools that aim at the management and organization of municipalities, thus playing an important role as an instrument for structuring Brazilian cities. The PDM can be understood as a “set of principles and rules that guide the action and the agents that build and use the urban space” (BRASIL, 2002, p.60). With this, it is possible to infer that the PDM acts as an orienting element of decisions that includes the space and activities developed within it.

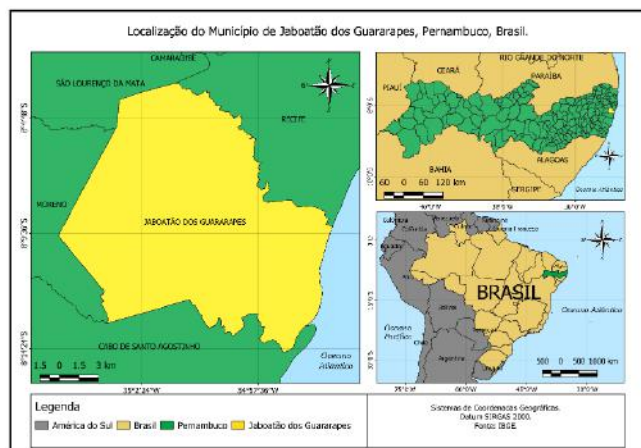


Fig. 1: location of municipality of the Jaboatão dos Guararapes, Pernambuco, Brazil.

The urban space is complex and dynamic, so the PDM must present itself with a continuous process, in order to achieve its guidelines and maintain its spatial organization. The Municipal Master Plan is a formal municipal law aimed at urban development and expansion, which includes zoning as a facilitating and indispensable instrument for its execution. With this Moreira (2008) affirms that the role of the PDM is to guide the development policy, aiming at the construction of cities that provide a better quality of life to the population, avoiding the consolidation and creation of illegal settlements in improper conditions.

Since it was instituted for Brazilian municipalities, the PDM is supported by the City Statute and, only through the PDM, it becomes possible to define the social function of the property and the city. In essence, according to Carvalho (2002), the PDM must contain some elements for its implementation, which are the legal instruments such as: Land appropriation, parcel of land and zoning.

As described in the Jaboatão dos Guararapes Master Plan (2013), there is the Citizen Environmental Education Project, which has the objective of promoting environmental education aiming at building a healthier and more pleasant environment, guaranteeing sustainability and affirming citizenship. Based on the reality of the municipality, the city government performs sporadic actions and workshops advising on the proper disposal of solid waste as a means of maintaining and preserving public space, as well as beach cleaning efforts, thematic

exhibitions, an ecological handicraft fair and partnerships with universities and colleges.

### III. METHODOLOGY

#### 2.3 SearchLocation

The analysis unit for this research is located in Brazil, in the state of Pernambuco, specifically in the municipality of Jaboatão dos Guararapes. According to IBGE (2019), the municipality of Jaboatão dos Guararapes has a population of 702,298 inhabitants, with 630,595 in the urban area and 14,025 in its rural area, spread over a territorial area of 258,724 km<sup>2</sup>, being the second most populous municipality in Pernambuco. It is limited to the north with the municipalities of São Lourenço da Mata and Recife, to the south with the municipality of Cabo de Santo Agostinho, to the east with the Atlantic Ocean and to the west with the municipality of Moreno (Fig. 1).

Geographically, the municipality of Jaboatão dos Guararapes, is inserted in the As' climate according to the Koppen classification. The annual temperature averages for the municipality of Jaboatão vary between 25 °C and 30 °C, not presenting great thermal amplitudes (MANSO et al., 2006).

Jaboatão dos Guararapes contains a coastal lagoon that, according to Ordinary Law No. 135/2002, published in the Municipal Master Plan, is no longer called OlhoD'Água Lagoon and is from there on to be called Náutico Lagoon (Fig. 02 ). The present lagoon has a perennial regime, being part of the estuary ecosystem of the Jaboatão River, characterized by the formation of sandbanks. Totally inserted in an urbanized area, the ecological balance of the lagoon depends on factors synergistic to this anthropized environment.

Currently, the lagoon is quite silted up, mainly in the South section, in addition to suffering pollution caused by sanitary wastes and garbage from informal settlements located in its surroundings, according to the Final Report of the Participatory Master Plan of the municipality of Jaboatão dos Guararapes, in 2006. Náutico Lagoon is a lagoon system, with 3.7 km<sup>2</sup>, extremely shallow, with two main feeder canals, one to the north, Setúbal Canal, and another one to the south, the OlhoD'Água Canal, making the connection between the lagoon and the Jaboatão River estuary (ASSIS, 1997).

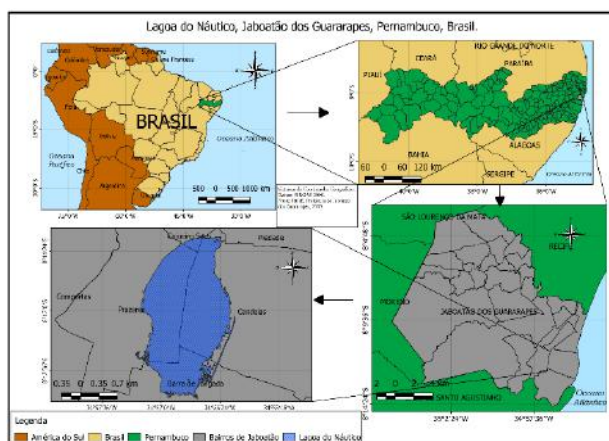


Fig. 2: location of the research unit –Náutico Lagoon.

According to Leal (2002), Náutico Lagoon corresponds to a waterbody inserted in the fluvial-lagoon plain, which settled between the two marine terraces and may be the remnant of a more peaceful period, probably the bottom of a cove, which corresponds to a pond that floods a very shallow depression. Originally, the Náutico Lagoon region and its surroundings were inserted in the Atlantic Forest Biome compounded of dense rain forest, mangroves and sandbanks (LEAL, 2002). Nowadays it is still possible to find small fragments of forests, few remnants of sandbank and a larger presence of mangroves due to their resilience.

### 2.4 Collectand Data Analysis

The research has a qualitative character, desk research on the subject, documentary research and on-site visit to the study area were used as methodological bases. The collection instruments that served as the basis for this research were satellite images of the Google Earth Pro tool for the delimitation of the analysis unit and observation of local conditions and, to support the theoretical framework, scientific articles, books, journals and the Master Plan of the municipality of Jaboatão dos Guararapes were used.

Legislative mechanisms were also used, such as Complementary Law No. 17/2013, available on the Internet, Federal Laws such as the National Environmental Policy No. 6.938/81 and the Cities Statute with the Artificial Environment Law and Law 9.795/99 that provides for Environmental Education and institutes the National Environmental Education Policy.

### 3 Results and Discussions

The focus of this research is Náutico Lagoon, inserted in an urbanized space that historically suffers from the pressure of urban agglomerations. According to Assis (1997), the occupation around the Lagoon occurred irregularly and without infrastructure, generating conflicts

between human occupation, the ecosystem and the physical environment. These agglomerations occurred gradually with the predominance of low-income settlements and streets with irregular layout, mostly occupying the lower areas and, therefore, more subject to flooding. (PDP Final Report, 2006).

According to the environmental legislation for the area comprising Náutico Lagoon, there is a federal legislation nº 12.651/2012, which establishes a Permanent Preservation Area (Área de Preservação Permanente, APP in Portuguese) in the areas located around natural lakes and lagoons; and the protection zone with a minimum length of thirty meters, for those located in consolidated urban areas.

For Maglio (2000):

Each sphere of government - Federal, State and Municipal - has different roles with regard to the implementation of public environmental management, which must be based on a management system that lists the institutional, legal and technical aspects to achieve the objectives and goals of the formulated environmental policy. (apud Rodrigues et al., 2012, p.98).

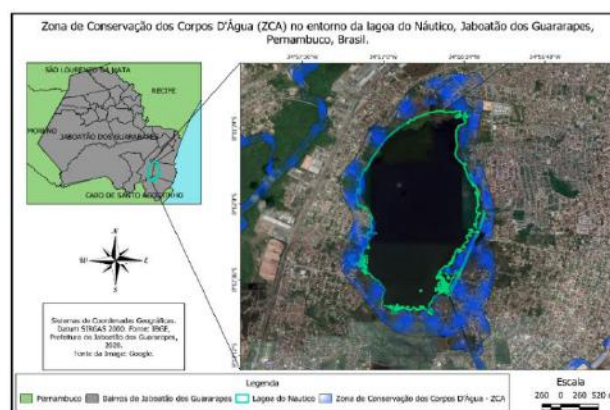


Fig.3: Water bodies Conservation Zone(ZCA) –Náutico Lagoon-PE.

In the Municipal Participative Master Plan itself, rectified in 2013, only the construction of small equipment aimed at supporting the operation of leisure and environmental conservation activities is permitted, in accordance with the restrictions of the permanent preservation area, and the launch of untreated sewage in the lagoon drainage basin is prohibited. In addition, the Urban Zoning published in the Participative Master Plan in 2013, delimits the Waterbodies Conservation Zone (Zona de Conservação Ambiental, ZCA in Portuguese) around the Náutico Lagoon (Fig. 3).

According to the Master Plan of the Municipality of Jaboatão dos Guararapes, the ZCA was established by the

city government to promote the conservation and maintenance of the existing waterbodies in the municipality. However, in Náutico Lagoon this delimitation has not been respected by the population.

These legal instruments and public environmental policies aimed at conserving the environment and mitigating environmental impacts, taking the case of Náutico Lagoon as a highlight, have not been efficient in ensuring the conservation of this lagoon ecosystem (ASSIS, 2011). The relationship between Náutico Lagoon and the urban space in which it is inserted is degrading, according to the Final Report of the Participative Master Plan (2006), the lagoon is characterized by an environment marked by the traces of human occupation.

Among the problems present in Náutico Lagoon and its surroundings, it is possible to mention the inadequate disposal of garbage, the lack of basic sanitation and the discharge of sewage without proper treatment, not only from the irregular communities installed in its surroundings (figure 04) but also, according to Leal (2002), from some neighborhoods in the municipality of Jaboatão, such as the neighborhood of Prazeres, Piedade, Candeias, Barra de Jangada, as well as more distant neighborhoods, such as the Boa Viagem district in the City of Recife, through the Canal de Setúbal. (Figure 05). And with this Andrade (2012) contributes that urbanization often expands the use of natural resources, generally compromising environmental and landscape quality.



Fig.4: Irregular occupation in the surroundings of Náutico Lagoon: (a) Satellite Image of the Vila Sotave Community (neighborhood of Prazeres - Jaboatão dos Guararapes); (b) Inadequate waste disposal and (c) Irregular housing on the west bank of the Lagoon.

Source: (a) Google Earth, 2020; (b) and (c) Rebeka Guedes, 2020.

Náutico Lagoon, as mentioned earlier, is inserted in the urban perimeter of the municipality of Jaboatão dos Guararapes, surrounded by irregular occupations that do not obey the current legislation. Currently, society's relationship with this lagoon system is worrisome. According to Soffiati-Neto (1996, apud Santos, 2008)

coastal lagoons are characterized as the Brazilian ecosystems that are most subjected to anthropic impacts and that these impacts have been present since the time of colonial Brazil.

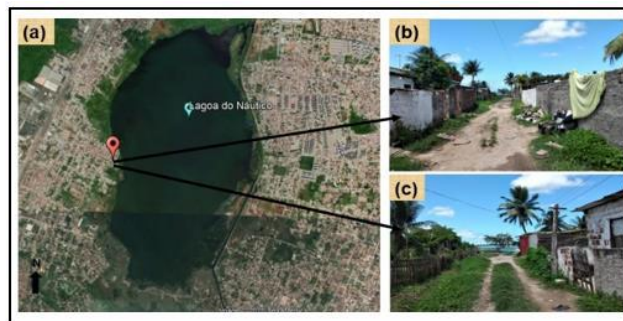


Fig.5: Setúbal Artificial Canal that ends at Náutico Lagoon: (a) Satellite Image of the Setúbal Canal; (b) Water pollution at the mouth of the Setúbal Canal.

Source: (a) Google Earth, 2020; (b) Rebeka Guedes, 2020.

The importance of Náutico Lagoon for the municipality of Jaboatão is enormous with regard to issues of local climate and biological maintenance for the urban environment (TENÓRIO, 2013). Náutico Lagoon has several potentialities that, even with the problems of environmental impact, pollution and disorderly occupation, present in its surroundings, it is still possible and necessary to search for alternatives that change the current scenario in which this lagoon ecosystem is found.

Based on the Municipal Master Plan made available by the city government and rectified in 2013, the landscape and biological importance of Náutico Lagoon and its great relevance as a drainage element during rainy seasons in the municipality are recognized, however actions must be put into practice so that, in fact, Náutico Lagoon becomes a balanced environment with potential that can be used by the population of the municipality.

According to the city government, there exists a project aimed at implementing the Náutico Lagoon Metropolitan Park, whose goal is to highlight the touristic and environmental potential of this ecosystem that is currently greatly weakened by anthropic pressures.

The implementation of this metropolitan park, according to the project made by the municipal management, will result in significant changes in the construction pattern of the area in order to render it compatible with the vocation and potential for tourism and leisure in the coastal area of the municipality, with the qualification of the landscape. The main objectives of the Náutico Lagoon park are:

- i. Recover and structure the management of natural ecosystems;
- ii. Mobilize resources to develop tourism products that increase the generation of work and income for the local population;
- iii. Implement leisure and support areas for needy communities;
- iv. Regulate existing irregular residential areas, lacking basic urban infrastructure and transport.

In short, the project that aims to set up the Metropolitan Park in Náutico Lagoon is very concise and, if put into practice by public agencies, will bring benefits to the local population, thus reversing the situation of abandonment that Náutico Lagoon is currently experiencing.

#### IV. CONCLUSIONS

The visit to the study area that encompasses Náutico Lagoon and its surroundings was of great importance to comprehend the context and the abandonment situation that Náutico Lagoon currently suffers, implying in the clear difficulty of executing the decrees and rules existing in the Municipal Master Plan and in the National Environmental Policy, in addition to the lack of investment by public agencies in this environment.

The Náutico Lagoon and its surroundings can be used in a positive way, highlighting its potentials such as the ecological and landscape diversity of this lagoon system, the possibility of creating leisure areas for the population and investment in infrastructure works in order to modify the current critical context in which the lagoon is inserted.

Therefore, what is missing for this region are public policies that efficiently seek to develop and structure this space, through the implementation of projects that integrate leisure areas, resulting in social well-being, tourism and a harmonious relationship between the natural ecosystem and the local population.

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