Evaluation of Joinville’s Eco-Tourism Potential in the Areas close to the Babitonga Bay

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ABSTRACT: This work rescues Joinville’s landscape patrimony, around the Babitonga Bay, seeking the sustainable tourism exploration; starting a real effective occupation; possible occupation areas; municipal, state and federal legislation; satellite images interpretation and photographic registration. Historically, the poor population invaded the swamps, occupying lower monetary value areas and fishing on flooded areas, generating sanitation problems, mangroves destruction and reducing the fish production on the area. The tourists potential of the bay is explored by the top social classes that possesses or rent boats. In the last few years, the eco-tourism has been growing up. The river margins not occupied, are being stimulated to be preserved and transformed in leisure areas, as lineal parks, that guarantees the conservation of the rivers drainage strips.

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INTRODUCTION

Babitonga bay, in the north of Santa Catarina State, in the south of Brazil, is one of the most beautiful, and little known, ecosystems of the country. In its’ margins are the cities of Joinville, Itapoa, Barra do Sul and São Francisco do Sul. It is a great estuary, with an area of 130 square kilometers (6200ha), enclosed by mangroves (the largest mangroves areas of the Southern of South America) and by great Atlantic forest untouched areas, which is the habitat of several species of the seafaring and terrestrial fauna. It shelters the SOS Penguin, a project developed by the Ecosul Environmental Institute for the protection and preservation of the penguins Spheniscus Maggelanicus, native species of Patagonia and Malvinas Islands. There is one of the areas wich larger archeological sites concentration of Sambaqui on the world. [1]

Downtown is placed on the bottom of the Babitonga Bay. To east, it extends until the swamps, and to west until “Serra do Mar”, a mountain chain. To the south it is limited with Araquari, and to north, with Garuva, two small cities. It presents a relief with three different characteristics: the mountain area, the plain area and the hills area. The human occupation occurs on the plain area, intercepted by several rivers with small extension and great flow, that extends until the swamps. The climate is seasoned and rainy, constantly humid. [4]

The existence of a great area of hidromorfics lands, mainly in the eastern area of the city, near the bay, demands as basic condition for its urban occupation a sanitation, through drainage works or by embankment.
2. MANGROVES OF BABITONGA BAY

The Babitonga bay has been suffering, since the beginning of its colonization, problems due to the pollution of their waters. The first families settled, in its great majority, on the Cachoeira river margins, beginning the creation of serious pollution problems: load of dejections spilled at its bed, which heads for the bay.

Historically, there is a tendency of the low-income population to invade the area of swamps, due to the low monetary value of these areas and used of the nearby flooded areas to increase their income with fishing and catching crabs.

Figure 3: mangroves of Babitonga bay

The irregular and disordered occupation in the region of Babitonga bay, concentrated close the Saguacu lake, was accelerated with the labor importation by the Industries of Joinville. This occupation generated problems of sanitation and destruction of the mangroves, nursery of the sea life.

The lack planning also contributed to the disordered occupations, disappearance of great swamps areas and native species. The lack of conscientization of this riverine population commits the improvement of the conditions that they look for, destroying the ecosystem and reducing the fish production of the area.

A continuous monitoration of the main rivers of the hidric complex, accomplished by FATMA (Municipal Foundation of Environment), since 1997, and in the bay, by IBAMA (Brazilian Institute of Environment) since 1998, point the area of the Saguacu lake, in Joinville, as being the area most committed. Among the causing factors of the pollution are the sewers, as the degradation agent most found in the area.

The mangroves areas of Babitonga bay, witch have degradation and pollution problems, were localizated with the aid of maps. Among them, there are the areas that surround the Cachoeira river mouth, where the laws of permanent preservation of swamps of the district are not established, being these defined the areas by the urban planning of Joinville (IPPUJ) as urban area. [5]

The map out done with remote measurement in the areas “under occupation tension”, submitted to the degradation and/or destruction by the human occupation, possibilitated, in the Babitonga bay areas and close to the Saguacu Lake to differentiate the several vegetation types present in it’s locality.[6] The Joinville City Hall, in a covenant with GTZ (German Society of Technical Cooperation) effectuated a wide socio-economic diagnosis, verifying growing problems in the periphery.

It was identified around all the Babitonga bay, dozens of lots and isolated houses, in the middle of mangroves. Some lots and houses have authorization of the city hall, because they are local where are native, usually fishermen, that, for ownership right, cannot be moved of their places. But, the great majority of the lots, found around the bay, are irregulars. They don't have authorization of the legal organs to occupy these areas. For lack of organs fiscalizators, these areas are invaded and occupied, generating the destruction of the preservation areas and their surroundings.

The lack of basic sanitation in those areas is a serious problem, degratating immediately the bay, besides harming the own population with diseases and epidemics. The main causes of the pollution of the waters of the Babitonga bay are the release of the domestic sewer in Joinville, Sao Francisco and Araquari and the rejections and efluents in Joinville and Araquari.[7] The area of Babitonga, therefore, is threatened by the growing urbanization, by the occupation of the mangroves and by the dejections.

Figure 4: Occupation around the Babitonga bay

Schaeffer-Novelli [8] presented a synthesis of the main types of environmental alterations verified along the Brazilian coast, with special emphasis to the mangroves ecosystem. Among them are listed the following degradation factors that are applieble to the Babitonga bay:
- Construction speculation;
- Harbor;
- Farming and pesticides;
- Deforestation (firewood, tannin);
- Predatory fishing;
- Embankment;
- Garbage;
- Mining;
- Invasion of reservations;
- Privatization of coastal areas;
- Drainage;
- Aquaculture and mussel culture.
2.1. Importance of the Babitonga bay mangroves

The importance of the mangroves comes from the colonization epoch. On December 04, 1678, the Royal Order considered that “these swamps will be of my privilege for being born in salty, where only the sea arrives and with the inundation be very necessary for the conservation of that people, locality and ships.”

The mangrove offers a great number of habitats for fauna. The slow deposition of flotation fragments, sediments, remains of shells and leaves in the entangled of roots, favors the appearance of habitats for animals whose pelagic larvas adhere to the trunks and roots. [7]. The occurrence of fixed populations of dolphins deserves special prominence: the tucuxi and the toninha, that reproduce inside the bay.

![Figure 5: Mangroves of Babitonga bay](image)

In the Babitonga bay the mangroves produce enormous amounts of organic matter, which are largely carried inside of the estuary, by the cycle of tides or by the rains, fertilizing its’ waters, propitiating shelter and contribution of nutrients to sustain complex alimentary chains. These flooded lands possess an extremely fragile and essential ecosystem for the development of countless sea species. [7]

The fishing in the Babitonga bay and its’ outline, it is the main source of income of 1.400 families in the area, registered in the fishermen’s colonies. This area may become a great producer of mussels. With the use of only 10% of the area of the bay for the mussel culture, it would be created up to 700 cultivation fields, providing 3.500 direct workstations, with an estimated production of 21.000t. To reconcile the economical exploratory potential with the development that is installed in the outline of the bay, is that the propositions of this work were formulated.

![Figure 6: The Babitonga bay: his hills and boots](image)

3. ENVIRONMENTAL LEGISLATION

The laws regarding the Environment: Federal, State, and Municipal Laws, were analyzed to evaluate the irregularities that have been happening in the area of the Babitonga bay and in its’ proximities, that promote the degradation, modification of the environment and the disappearance of native species. It was verified if there are contradictions regarding areas of permanent preservation, or areas that should be qualified as preservation areas.

3.1 Laws regarding the Rivers

In agreement with the Brazilian Constitution, Law n° 4.771 of 15/09/1965, art.2°[9], in common agreement with the Complementary Law n° 29 of, June 14th, 1996 of the Municipal Code of Environment [10], it is considered permanent preservation areas, the forests and other forms of natural vegetation placed:

a) along the rivers or any other water course, obeying the minimum preservation band of their margins according to the classification of the table 1, in agreement with the width of its’ bed:

<table>
<thead>
<tr>
<th>Rivers width (meters)</th>
<th>Riparian band (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 (ten) to 30 (thirty) m</td>
<td>30 (thirty) meters</td>
</tr>
<tr>
<td>10 (ten) to 50 (fifty) m</td>
<td>50 (fifty) meters</td>
</tr>
<tr>
<td>50 to 200 (two hundred) m</td>
<td>100 (a hundred) meters</td>
</tr>
<tr>
<td>200 to 600 (six hundred) m</td>
<td>200 (two hundred) m</td>
</tr>
<tr>
<td>Superior to 600 m</td>
<td>500 (five hundred) m</td>
</tr>
</tbody>
</table>

b) Around the ponds, lakes or natural or artificias reservoirs of water;

c) In the source, although intermittent and in the nouns as “eyes of water”, any topographical situation, in a minimum radius of 50 (fifty) meters;

d) On the top of hills and mountains;

e) On the hillsides or part of these with superior steepness than 45°, equivalent to 100% in downhill greatest steepness;

f) On the sand banks, such as dunes fixators or swamps stabilizators;

g) On the borders of the plateaus starting from the line of rupture of the relief, in strip never inferior than 100 (a hundred) meters in horizontal projections;

h) On superior altitudes than 1.800 (thousand and eight hundred) meters, whatever its’ vegetation is;

Unique paragraph - In the urban areas, localized in the urban and defined perimeters by municipal Law, and in the metropolitan areas and urban gatherings, in the whole included territory, the determination will be observed in the respective master plans and laws of use of the soil, respecting the beginnings and limits this article refers to.

3.2 laws regarding the preservation of mangroves

The permanent preservation areas of swamps, delimited by the municipal district, in accordance to the Federal, State and Municipal laws were:

Federal law that instituted the New Forest Code (Law n° 4771 of September 15, 1965) [11] art.2°: it is
considered of permanent preservation, only by the effect of this law the natural vegetations located in the sand banks, such as dunes fixators or swamps stabilators.

State law (Law n°6063 of May 24th, 1982) [12] art.6°: it is considered area of special interest the necessary ones to the preservation of the Environment, and the ones that concern the protection to the springs or the cultural, artistic, historical, landscape and scientific patrimony.

Municipal Complemental law n°27 of March 27th, 1996, art.6°[13]: it defines that the swamps are areas of permanent preservation.

In agreement with those laws, all the places that exist or may exist mangroves are properly protected by federal law, independently of any other federal, state or municipal instruments [14].

3.3 laws regarding lands of the Navy
The federal decree n° 9.760, of September 5th of 1946, [15] denominates lands of Navy and the ones added to it, all lands located in the continent, in the marine coast, in the margins of rivers and ponds, and outlining islands, until the influence of the tides exists.

"Art. 2°. It is Navy land, in a depth of 33 meters, measured horizontally, for the part of the land, of the position of the line of the high tide-medium of 1831:

a) the ones located in the continent, in the marine coast and in the margins of rivers and lakes, up to where it is felt the influence of tides;
b) the ones that outline the islands located in areas where it is felt the influence of the tides.

Unique paragraph - For the effects of this article, the influence of the tides is characterized by the periodic oscillation of 5 centimeters at least of the level of the waters, that happen during any time of the year."

The mangroves and its' occupation, legal or illegal developed on the Navy lands.[16]

Starting from the delimitation of the preservation areas, defined for the Joinville City Hall, in common agreement with the Federal, State and Municipal laws, the areas were identified and classified in: Greens Preservation Areas (APV) and Mangroves Permanent Preservation Areas (APPM).[5]

4. ECOLOGICAL TOURISM IMPLANTATION
During the last years, the Echo-tourism proliferated in the country. Several areas of Brazil seek for an income through the exploration of this kind of the tourism. Joinville has been altering its' economical die, traditionally leaned in the industrialization, by a complementation through the support to the development of trade activities and services [15].

The Rural Tourism is becoming one of the tourist products more valued, because of its' singularity and strategic importance for the preservation of the agricultural areas close to the city, that also integrate the areas of preservation of water sources. [2]

Babitonga bay shelters an archipelago of twenty four islands, close one to the other, considered a paradise for the lovers of nautical sports and of eco-tourism. The tourist potential of this area is explored by the population of wealthier social classes, possessors marine transportation means or financial conditions to enjoy the leisure offered by particular boats of leisure, as the Príncipe of Joinville Boat, that travels by Babitonga bay, departing from the yachts Club of Joinville, in the neighborhood Boa Vista. This is the only constant sail publicated by the IPPUJ (Institute of Research and Urban Planning of Joinville). In the same publication there are 5 private yachts clubs.

![Figure 7: Islands and fishing boots on Babitongas bay](Image)

The proposal of implantation of eco-tourism in this area is important due to the urgency of preserving the water sources greatly degradated by the great improper occupation and by the level of contamination of several rivers that spill its' waters in the bay. This project intends to promote the rediscovered of the Babitonga bay, making the population to enjoy and to preserve that patrimony. The eco-tourism intends to provide to the population a greater understanding of the environment with its unaffectected characteristics, seeking the tourists' attraction and making possible the capital entrance in the city.

The forms of urban space appropriation are conditioned partly by the local topography, quite rough, and that presents as morphological characteristic countless depressions (bottoms of valleys) that possesses humid soils – barrier spring - being frequent the occurrence of puddles, small water courses, and important rivers that drain towards Babitonga bay.

The valley bottoms and river margins, still no committed with occupation, should be stimulated to be preserved, with the gradual transformation in equipped leisure areas, in a conception of linear parks, that would guarantee the conservation of the drainage band of the rivers and the consequent decreasing the flooding problems, that were worsened in the areas where irregular occupations happened.

The rivers that belong to Babionga bay, in the area of Joinville, were classified, in agreement with the mentioned laws, and it was verified that there are no rivers with more than 50m width. Those fauna and flora holders margins, will be preserved, integrated into the possible on eco-tourism implantation areas. The margins should be preserved, because,
periodically they suffer influence of the tides, flooding constantly those areas.

The population contact and interaction with the bay’s and swamps’ biodiversity will facilitate and stimulate education and environmental preservation actions, making it possible walks and monitored scientific studies in the channels for a better understanding and study of this ecosystem.

4.1 Ecological parks

Joinville was born vocacioned for the tourism: "if it was not a city, certainly those lands would be a Park". [2] Its’ receptive infrastructure is being qualified with actions to modernize the Airport, the Bus station and the recovery of the Rail Station.

In the 90’s, three great parks were created in Joinville: Park of the Finder Hill, Zoobotanic Park and Park of the Wood, that improved the options of leisure of the Joinville citizens. [3]

Figure 8: Ecological-tourism in Caieira Park

IPPUJ and the City hall are elaborating transformers and structuranting projects for the definition of a new city model, based on a new economical die, more turned to the services, tourism, entertainments, events and culture. The Joinville Urban Structuring Plan created in 1987 [17] three preservation areas:

1 - Area of Permanent Preservation of the Swamps: areas totally occupied by the occurrence of swamps, in estuarine area of the Cachoeira river, no reached by the future Babitonga bay ecological station.

2 - Area of the Ecological Station: include all the swamps and the transition vegetation, located between Palmatal river, in the east, and the Iriuí-guaçu and Ferro rivers, in the west, and in the sense south-north starting from the Vaca and Firmo Dias Islands towards the city of Garuva. This area shall be constituted of a space reservation, for the efetivation of Babitonga Bay ecological station, by the Federal Government through the Special Environment General Office - SEMA.

3 - Area of Environmental Protection of the Ecological Station: it is a land area 500 meters width, located between the Babitonga Bay Ecological Station, and the proposed limit for the urban perimeter of the city of Joinville, marked by the swamps protection channel projected by Hidrographic Basins Nucleus.

Figure 9: The Swamps Protection Channel

The same plan has the intention of registering with SEMA, all the Environmental Protection and Permanent Preservation areas established by municipal legislation. It recommends the definition of mechanisms that restrict or impede the occupation of areas that may be flooded, mainly the ones in the low land along Cubatão, Mississipe and Braço rivers, in the northern area, and of Águas Vermelhas river in the western area of the city.

The rediscovery of Babitonga bay, exuberant natural resource still little known in the country, in the state and even in the city, will happen with the implantation of the Ecological East Axis, that will facilitate the access to the “Porta do Mar”, in the neighborhood of Espinheiros. The structuring and organization of this area that has been, in the last few years, the contact between the city with the Babitonga bay, its islands, localities and São Francisco do Sul, will integrate Joinville also to the sea. A northern loop will make the connection with BR-101, in Pirabeiraba, which is the main highway in the area. And a southern loop will make the connection with BR - 280, in Araquari. Both will create an structure of road outline and regional road conection with differentiated characteristics.

The Law 1262/73 [17] created the “Perimetral Leste”, road guideline known as Beira Mangue. This east stretch, considered a linear park with 16km of extension, accompanying the channels sitters of the urban occupation from the remaining swamps, and makes possible in the greatly occupied areas, small squares, nook and woods, interlinked by a green bike lane and sidewalk, besides the preservation and environmental education strip between the road and the open channel.
CONCLUSION

Starting from the determination of the preservation areas, it was identified, by Satellite images, rivers, floodable lands and unfloodable lands, possible places for occupation and subsequent installation of parks and ecological stations.

Figure 10: The Caieira Park

At the same time, a connection point is created between the sea and the Caieira Park, on the other side of the Saguaçu pond and also with Amaral Hill and Vigorelli, places with ecological-touristic potentiality, that need investments in environmental recovery and social reeducation.

The project also creates connection with other smaller localities with ecological-tourism potentialities, needing investments in environmental recovery and social requalification. With this infrastructure will be possible to dock, in a public place, recreation embarkations in traffic by the Brazilian coast, as it happens in the marine cities around the world.

The swamps areas are permanent preservation areas, where the exploration, construction and the practice of burning are not allowed. The punishments for these infractions are hard, and many of them does not have bail. We should protect those areas, to disable irregular occupations, making it possible the creation of ecological stations, ecological parks, among other projects that seek the conservation of the environment.

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