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SciELO

Environmental perception of ecosystem services and degrading impacts to the mangrove by the urban population, Babitonga Bay-Brazil

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Abstract: The mangroves of Babitonga Bay are rich ecosystems that provide numerous ecosystem services (ES). Such recognition is fundamental for their preservation. However, several threats affect the supply of these ES. With the objective of analyzing the environmental perception of the coastal urban population regarding the SE of the mangroves and the degrading impacts on the ecosystem, questionnaires were applied to residents of neighborhoods that suffered historical losses of mangroves in the municipality of Joinville - SC, Brazil (Boa Vista and Comasa). Quantitative and qualitative analyzes (content analysis) were performed. The results indicate that cultural (leisure) and provision services were perceived as the most important by the population, followed by the disposal of waste, the filling of the mangrove soil embankmentand the lack of sanitation. Our findings highlight the need to promote environmental education, basic sanitation, and the creation of leisure spaces to alleviate pressure on the studied coastal wetland.

Keywords: Coastal ecosystems; environmental services; indirect users; perception; environmental degradation; content analysis.

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Introduction

Mangroves are productive, complex, and adaptable transition ecosystems present amongst latitudes of 32ºN and 38ºS at the interfaces between sea and land (SPALDING, 2010). These ecosystems are present in approximately half of the world's countries and their relevance is extensive (UNEP, 2014), as they provide diverse ecosystem services (ES), i.e., regulatory, provision, support and cultural benefits for individuals, communities, and the balance of ecosystems (MEA, 2005).

Among the ES that mangroves provide are soil stabilization through sediment retention; maintaining water quality; climate regulation; the provision of food through subsistence and commercial fishing; provision of firewood and fibers; nutrient cycling; pest and disease control; the animal nursery; and diverse cultural services such as tourism and recreation, heritage, aesthetic values, among others (AFONSO et al., 2021; UNEP-WCMC, 2006). Furthermore, it is worth highlighting their importance in protecting coasts by minimizing the impacts of extreme events (strong storms, waves, tsunamis) on coastal populations (DONNELL; TOMICZEK; SCYPHERS, 2022; EJF, 2006; SPALDING et al., 2014).

Such services are not only theoretical: they bring with them the "integration of social, economic and ecological perspectives, linking ecosystem processes to human well-being" (LIMA; BASTOS, 2019, p. 1), and are therefore useful to analyze how coastal populations perceive such benefits. The study of environmental perception entails understanding the human-nature relationship since perception is formulated through the relationship between the observer and their environment (LYNCH, 2011) in a process that begins with the interpretation of reality towards individual's action (KOHLSDORF, 1999; OKAMOTO, 2014). In this way, environmental perception is related to individuals' behavior in the environment, which can culminate in the preservation or degradation of the mangroves.

Previous studies evaluated the environmental perception of direct users of Babitonga Bay (i.e., fishers, shellfish farmers, tourism, and recreation agents, etc.) regarding the ES identified by the actors through a participatory diagnosis (GERHARDINGER et al., 2021; HERBST, 2020). However, some of the agents who interact with the mangroves do not do so directly but have some relationship of proximity and benefit from the mangroves because they live in neighborhoods that were built on or around the mangroves. Therefore, understanding the environmental perception of indirect agents, who may be greater in number than direct mangrove users, is important as it promotes a better ecosystem management strategy and greater efficiency and effectiveness of environmental policies (VREESE et al., 2016).

Furthermore, despite the various ES, Brazilian mangroves face numerous threats, such as aquaculture, agriculture, logging, the fishing industry, urban, industrial and tourist facilities; and climate change (ICMBIO, 2018). In Babitonga Bay, on the north coast of Santa Catarina, the main degradations found are related to air and water pollution, due to emissions from surrounding industries and domestic sewage, as well as incorrect disposal of waste (RODRIGUES, et al. 2005; GERHARDINGER, et al., 2021); which

cause wide impacts on the entire ecosystem. Specifically in the coastal region of Joinville, illegal occupation of land in mangrove areas, due to urban growth, industrialization, and real estate speculation, has affected the ecosystem since the 1950s (CRISTOFOLINI, 2013; MOSER, 1993; SOUZA, 1991).

Given this situation, the present study aims are twofold: (i) to evaluate the environmental perception of the urban population residing in the surroundings of the Joinville mangroves (SC, Brazil, part of Babitonga Bay) regarding the ecosystem services that the mangroves provide for them and the community in general; (ii) to investigate the population's perception of the factors causing mangrove degradation, with the intention of generating a reflection on the reality and current awareness about the importance of preserving this rich ecosystem.

Methodology

Study area

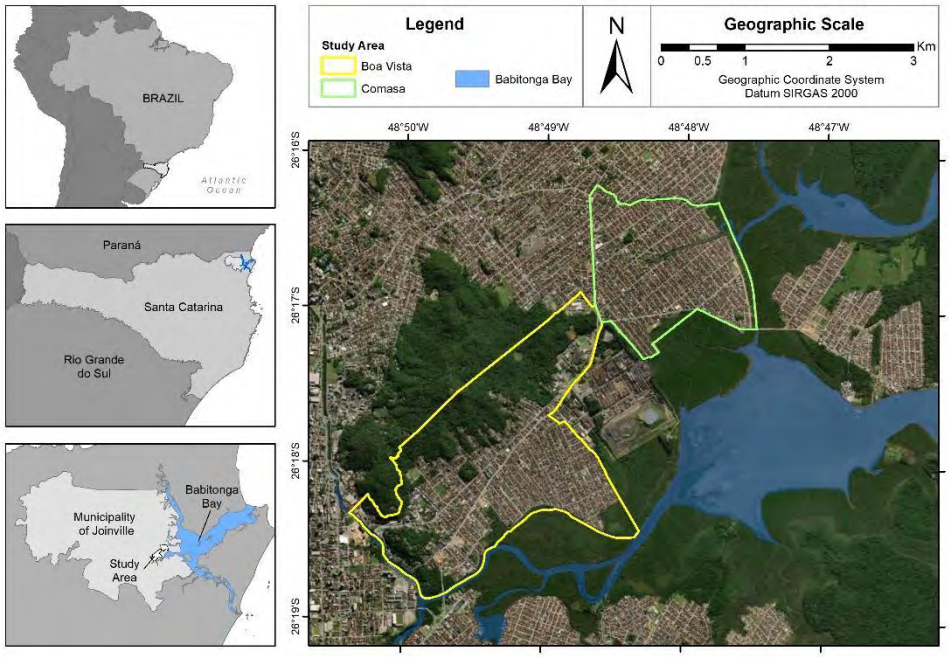
Babitonga Bay is an estuarine complex that covers an area of approximately 160km^2 on the coast of the state of Santa Catarina, home to the largest mangrove forest in the state (around 62km^2). Babitonga Bay area encopasses six municipalities: São Francisco do Sul, Joinville, Balneário Barra do Sul, Itapoá, Garuva and Araquari (FATMA, 1984; FELDHAUS et al., 2020; GERHARDINGER et al., 2021; IBAMA, 1998). The ecological and social relevance of the Bay is evidenced in several studies that have documented its fauna (BOEING et al., 2023; OLIVEIRA-NETO et al., 2014) with emphasis on *Endocimus ruber* (also called scarlet ibis) (FINK; CREMER, 2015; GROSE; FINK; CREMER, 2019; GROSE, 2016) and the porpoise Pontoporia blainvillei (Franciscana), a species endemic to the southwest Atlantic whose occurrence in bays is unique in Babitonga Bay (CREMER; SIMÕES-LOPES, 2005; CREMER; SARTORI; SCHULZE, 2014); its flora (FELDHAUS et al., 2020); and the artisanal fishing (PINHEIRO; CREMER, 2003). Furthermore, the region is classified by the Ministry of the Environment as an area of extremely high ecological importance due to its relevance for the conservation of the marine coastal zone in the Atlantic Forest biome (MMA, 2018).

The study area comprises the Boa Vista and Comasa neighborhoods (Figure 1), in the municipality of Joinville, which has the largest population in the state (approximately 600,000 inhabitants) and is located in the northeast part of Santa Catarina (IBGE, 2020). It is part of the Atlantic Forest biome, which comprises rainforests and several associated ecosystems, such as mangroves (approximately 36.54km^2, which correspond to more than 50% of the total mangrove area of Babitonga Bay) (PMJ, 2020). In the study area, mangroves are not part of conservation units, and the regulation of the territory is governed by the municipality's master plan (complementary municipal law no. 470, of January 9, 2017).

The municipality's mangrove forest has been intensely degraded due to population and industrial growth. In the Boa Vista and Comasa neighborhoods the move of a

large metallurgical plant from the center of the municipality to the region resulted in an increased need for housing, causing illegal occupation of land in the mangroves (CRISTOFOLINI, 2013; SOUZA, 1991). The Boa Vista (B) and Comasa (C) neighborhoods have similar sociodemographic characteristics: average income is 2.03 (B) and 1.52 minimum salary (C); the population is young (49% (B) and 48% (C) are aged between 26 and 59); 86% (B) and 90% (C) of the houses are primary residences (PMJ, 2017).

Figure 1: Study area.



Source: Created by the authors, 2023.

Materials and Methods

The research method was mixed (quantitative and qualitative) (CRESWELL; CLARK, 2015) based on a structured questionnaire with open questions that assessed the perception of residents of the Boa Vista and Comasa neighborhoods in Joinville, SC regarding the ecosystem services provided by the mangroves and the factors causing degradation observed in this ecosystem (table 1).

Table 1 – Structure of the data collection instrument

THEMATIC AXES	QUESTIONS
Socioeconomic Profile	Gender, skin color, age, marital status, place of birth, nationality, education, religion, number of residents, property, occupation, income, and mangrove income.
Perception of Ecosystem Services	Do you believe that the mangrove brings any benefits to you? ( ) yes ( ) no, if yes, which ones? Do you believe that the mangrove brings any benefit to the residents of the neighborhood? ( ) yes ( ) no, if yes, which ones? How often do you visit the mangrove area and surrounding areas? And to do what? Is there a time of year when you visit the mangrove area and surrounding areas more and why?
Perception of Impacts	What impacts do people cause to the mangroves that you observe? Of these impacts, what are the five main ones? Rank from 1 (most relevant) to 5 (least relevant).
Perception of ES and Impacts	What do you think the city hall should do with the neighborhood's mangrove area? If you could decide what to do with the city's mangrove area, what would you do?

Source: Created by the authors (2023) based on GALVÃO; TEDESCO (2022).

Data collection occurred through the application of a structured questionnaire (25 questions) with the local urban population in the studied area (Figure 1) between June and August 2021 in individuals over 18 years of age. Participants were selected according to their availability to respond to the research, according to the survey method, that is, a non-probabilistic convenience sample (FREITAS et al., 2000; GIL, 1989). In total, 53 (fifty-three) interviews were carried out, 32 (thirty-two) in the face-to-face format and 21 (twenty-one) in the online format [1].

Data analysis followed the content analysis (categorical) methodology developed by Bardin (2011). The Sonix software was used to transcribe the audios and the ATLAS.ti software was used for categorical analysis. For descriptive analyzes of the participants' socioeconomic profile, the Stata-13 statistical software was used.

During content analysis, the interviews were re-read to code and categorize ES

1 - Format adopted due to the data collection being carried out during the COVID-19 pandemic. All face-to-face interviews followed WHO protection standards to prevent the spread of the virus.

and their impacts. The formulation of the ES categories followed the Millenium Ecosystem Assessment (MEA, 2005) and the theoretical framework of Nature Contributions to People (IPBES, 2019). The categorization of impacts was constructed together with the exploration of "emerging" data from the respondents' answers. Besides, inferences were drawn to trigger a reflection and generate conclusions on the role and importance of preserving the mangroves.

Results and Discussion

First, the profile of the interviewees is presented in a descriptive way. Then, environmental perceptions of ecosystem services and the perception of factors causing mangrove degradation by the urban population are analyzed. The results are organized into graphs and tables that detail the frequency of categories (SE and impacts) mentioned in the interviews by the total number of participants, as well as transcribed excerpts from statements to complement the analysis.

The interviews were carried out with 53 (fifty-three) individuals living in the Boa Vista and Comasa neighborhoods in Joinville, SC (as shown in Table 2). In total, 21 men and 31 women participated in the research; the majority white (78.85%) with an average age of 44 years; 50% from Joinville and 50% from other locations; education level between higher education or more (48.08%), complete secondary education (32.69%) and complete or incomplete primary education (19.23%); average income (per household) of three and a half minimum wages (minimum wage worth R$1,100.00).

Table 2: Sociodemographic characteristics of the studied population

Characteristics	Absolute frequency (f), Relative frequency (%) or Average (SD)		
	Male	Female	Total
Gender (f)	22	31	53
Ethnicity (%)			
White	39	61	79
Black/brown	60	40	9
Others	50	50	8
No declaration	0	100	4
Mean age (SD)	44,5 (12,9)	44,2 (12,6)	44,3 (12,6)
City of birth (%)			
Joinville (SC)	42	58	50
Other Municipality (SC)	40	60	19
Other states	40	60	29

Other countries	0	100	2
Scholarity (%)			
Incomplete Elementary	50	50	11
Elementary school	50	50	8
High school	52,9	47,1	3
Higher education	28	72	48
Mean number of inhabitants per household (SD in brackets)	3, 3 (1,1)	3,20 (1,1)	3,2 (1,1)
Mean monthly income per household (SD in brackets)	3,6 (0,9)	3,5 (1,1)	3,54 (1,0)
Mean years of residence in the neighborhood (SD in brackets)	26,3 (17,9)	23,8 (16,9)	24,8 (17,1)

Source: questionnaire data, 2023.

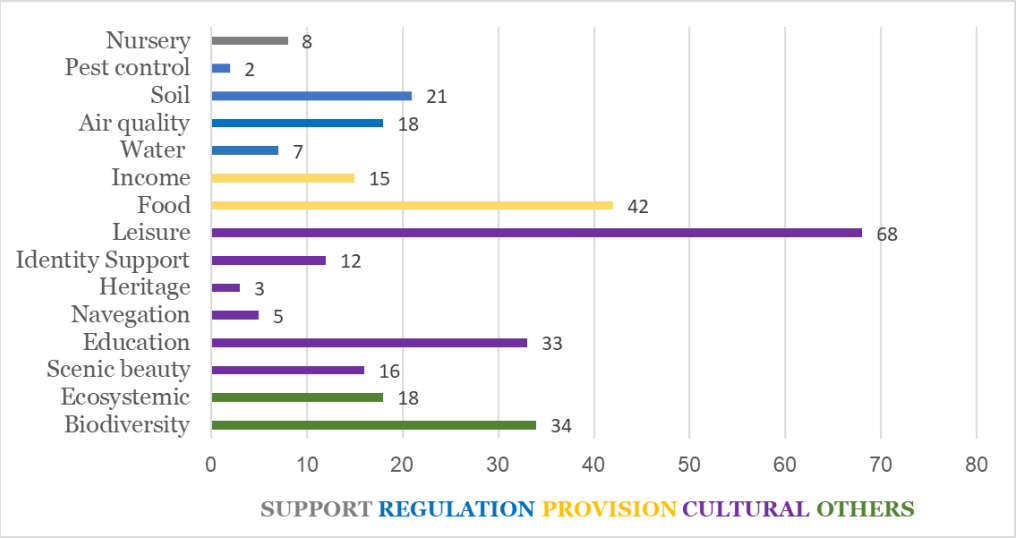
Abbreviations: f (Absolute Frequency), SD (Standard Deviation), SC (Santa Catarina).

1. Environmental perception of ecosystem services

The analysis of the environmental perception of ES showed that the coastal urban population of the study area perceives several ES present in the literature (DÍAZ et al., 2015; IPBES, 2019; MEA, 2005), such as provision (e.g. food and income), regulation (e.g. flood protection, climate maintenance, and filtering pollutants), cultural (e.g. tourism, leisure, scenic beauty, identity support, heritage, navigation, education), support (e.g. animal nursery) and others (e.g. ecosystem and biodiversity), as shown in Figure 2. Additionally, it was possible to identify from the survey participants' responses that society places several values in the human-nature relationship that are not only instrumental/economic and intrinsic, but also relational, i.e., they bring preferences, principles and virtues of what people consider significant in their relationship with nature (CHAN; GOULD; PASCUAL, 2018).

The most frequently mentioned ES were those related to the "cultural" category, which received 137 mentions, followed by the "provision" category (57), "others" category (52), "regulation" category (48) and finally the "support" category (8), as shown in Figure 2. This result corroborates other perception studies that concluded that populations perceive cultural SEs more easily to the detriment of others (HERBST, 2020; HERBST; GERHARDINGER; HANAZAKI, 2020).

Figure 2: Absolute frequency of ES identified by the population studied through content analysis according to the ES categories: support, regulation, provision, cultural and others (N=53). The chart bars only include codes created from the mentioned main words.



Source: Prepared by the author (2023). Note: other benefits mentioned but not included in the figure, stimulates the region's economy (1), housing (1), noise barrier (2).

Mangroves' role in climate regulation and maintenance of air quality (as shown in Figure 2) as well as their benefit for coastal defense, mainly against flooding ("soil" in Figure 2) was evidenced by the studied population. This echoes the perception of communities in La Encrucijada, in Mexico, who also recognize the mangrove ecosystem services for protecting slopes against flooding (CARRANZA et al., 2018). This result highlights the population's recognition of the soil and air regulation service provided by the mangrove forest. However, "regulation" services were mentioned almost three times less than "cultural" ones (48 and 137 mentions, respectively), which aligns with other studies that show that those ES are less noticeable by communities in comparison to "cultural" ones (DORJI; AL, 2019; HERBST; GERHARDINGER; HANAZAKI, 2020).

Moreover, floods are historically frequent in the region and the benefit of the mangroves as a natural flow or barrier to prevent damage was highlighted in some participants' responses:

> "The other benefit of the mangrove is the fact of flooding. When we still had this mangrove area, we didn't have the floods that we have today." (G., interviewed).

> "But it is also important in containing water, right? Because the more mangroves are destroyed, the more the sea invades this region." (K., interviewed).

However, the benefit of water purification and sewage treatment ("water" in Figure 2) was less mentioned than the other "regulation" ES ("soil" and "air quality", Figure 2). This could be due to the fact that the region is heavily impacted by sewage and industrial pollution (as evidenced in the analysis of the perception of degrading impacts in the next section).

In relation to cultural ES, the most frequently cited was "leisure", which is the predominant use of the mangroves and the surrounding area by the population, i.e., for hiking, cycling, physical exercise, and walking with the family (as shown in Figure 2). This aligns with finding from elsewhere: The Murray-Darling Basin community in Australia also attributed high value to tourism and leisure ecosystem services in the studied region (RAYMOND et al., 2009).

In an area of the mangrove region studied (known as "Beira mangue") there is a coastal path for tourism and leisure activities. In the 1980s, the *Mangue Project* was implemented by Joinville City Hall (after pressure from the population), with the aim of providing better housing conditions for the settlements and containing the advance of urbanization on the mangroves. One of the objectives of the Project was to build channels that functioned as physical barriers between the occupied areas and the remaining mangroves (MOSER, 1993). Therefore, in 1990, the City Hall built "Beira Mangue Avenue" and a canal between the coast and the mangrove forest in the Boa Vista neighborhood (CRISTOFOLINI, 2013). It is on this path that the studied population benefits from the cultural SEs "leisure" and "scenic beauty" of the mangroves the most (e.g., by observing animals and appreciating nature – as shown in Figure 2).

When asked what they would do with the neighborhood's mangrove area or what they believed the city hall should do; many respondents suggested expanding leisure and observation spots (even in already degraded areas of the mangrove):

> "Increase the track there for a bike lane, make a bridge, connecting something like that there. As I told you in that area on the other side, there is a very open area of woodland, if there were a park, […] that would be cool" (V., interviewed).

> "I would make more intuitive parks like this for the community itself with the mangrove." (C., interviewed).

> "Preserve more, have places for people to go, open square, benches. Leisure area like the Lagoa in Rio de Janeiro." (D., interviewed)

> "I would create a space for people to visit." (G., interviewed).

> "Beautify, leaving a beautiful place with easy access for walks" (E., interviewed).

These quotes bring various suggestions for interventions to expand leisure areas around the mangrove forest. From the analysis of the results, it is understood that the population believes that the creation of new leisure spaces in areas that are already fully urbanized can alleviate pressure on mangrove areas and promote greater human-nature integration. Furthermore, when analyzing the urban structure of the Boa Vista and Comasa neighborhoods, it is observed that both lack leisure areas, such as wooded parks that are easily accessible to the population (PMJ, 2017).

The coexistence of communities with the mangroves brings benefits to the subjective and psychological well-being of individuals that can be promoted with the sustainable use of the ecosystem (GUEK-NEE, KE et al., 2022). However, questions remain on how this coexistence should be carried out, given that historically mangrove areas were occupied illegally and affected by real estate speculation. Although environmental legislation restricts land planning in mangrove areas that are configured as permanent preservation areas (according to the Brazilian Forest Code, law n. 12,651/2012), such land occupations are still recurrent (see next section). Moreover, studies point to tourism and leisure as key factors in the degradation and destruction of mangroves worldwide (SANDILYAN, S., KATHIRESAN, 2012) as they can cause loss of biodiversity, from the death of birdlife (SANDILYAN, THIYAGESAN; NAGARAJAN, 2008) to benthic animals and destruction of microhabitats through trampling or recreational hiking (ALONGI et al., 2005; ROSS, 2006).

Regarding the "education" service, it was mentioned that the mangrove forest is important for this purpose, mainly in relation to the need for public authorities, universities, and civil society to create awareness programs to highlight the importance of preserving the mangrove forest and stopping its degradation. However, only three respondents reported the occurrence of educational activities in the region studied, despite the profound impact this experience can have on people:

> "The schools speak well. At least when I was studying, we even got to go and do some work at school, going to the mangrove" (V., interviewed).

> "I taught there. So, we also took the students to visit and do studies in the area" (K., interviewed).

> "My son is 22 years old. I raised my son here. I raised him here around the mangrove forest. I would take him to see the crabs, the little crabs in the holes around him. Because he always liked it a lot [...] I was always with him, always close to him, taking care of him, teaching him, showing him [...]" (Z., interviewed).

Furthermore, the interviewees did not mention socio-environmental projects

executed by the third sector, which could mean either their absence, ignorance of their existence or the lack of access to these projects for the local population. The diagnosis of environmental education actions implemented in the municipality only presented an association of residents of the municipality's neighborhoods and the Hydrographic Basin Committee of the Cubatão Norte and Cachoeira rivers as non-governmental organizations that performed environmental education actions and did not mention any specific project in the mangroves by these institutions (PMJ, 2011). Actions that integrate tourism, leisure, and education can be an avenue to raising awareness about ecosystem preservation.

The "other" category encompasses ecosystem benefits in a generic way and biodiversity, which are considered as intrinsic values of ecosystems (IPBES, 2019). The biodiversity of fauna and flora was mentioned as SE. However, the presence of avifauna was not so often mentioned (only 8 times) despite the region having a rich variety of species that represents 70% of the avifauna of Santa Catarina (GROSE; FINK; CREMER, 2019) and the fact that Joinville has a strong incidence of the scarlet ibis (Eudocimus ruber) (FINK, 2018), a species that can be easily spotted in the study area. Some interviewees confused the red ibis with flamingos, which shows the population's lack of knowledge of mangrove bird species.

The importance of mangroves as a source of food and income was also highlighted, with the "provision" category being the second most cited (Figure 2). This corroborates other studies that have shown that people perceive provision services more easily (mainly because they draw direct benefits from them) (DORJI et al., 2019; GERHARDINGER et al., 2021). While mangrove provisioning services were recognized as important by a majority of respondents, only three interviewees were direct users of the mangrove forest and depended on it for their livelihoods as they collect fish and obtain income from this collection. This data may indicate that the activity exists, i.e., they observe that other people practice it and obtain income from this activity, but the majority studied do not perform it effectively, probably because they obtain their source of income from other sources of jobs.

Quotes also highlight the diversity of services from the provision category perceived by the population in the studied region, who understand that for some individuals, fishing and collecting fish are the main activities related to the source of income and subsistence of families; and for others, they are activities that provide additional income or are linked to leisure and can be done by traditional fishermen or residents in general:

> "There are many fishermen on our street. They don't specifically make a living from [the mangroves], but let's say they make an additional living from it" (C., interviewed).

> "So, one of the points is this, because there are several families that in December, November - I don't know if they do it in the most correct way - but they remove some crabs from there to support themselves, a way of earning money." (F., interviewed).

> "When I was much younger, I used to catch crabs, that sort of thing, right? Today I also fish in the mangroves" (R., interviewee).

> "I know residents who are there every weekend fishing" (L., interviewed).

> "Many live on crab food and depend on the mangroves to survive." (G., interviewed).

Nonetheless, it is necessary to evaluate the environmental quality of the fish collection sites and the sanitary quality of these foods, as several factors of mangrove degradation have been reported by the population (see next section). Furthermore, a recent study confirmed the existence of mollusks infected by antibiotic-resistant enterobacteria in Babitonga Bay in a region close to the studied area (NOVAK, 2023).

The "identity support" category created by IPBES (2019) brings the concept of nature providing opportunities for people to develop a feeling of belonging, purpose, connectivity, and rootedness with the environment. The feeling of connectivity has been found to be the relational value most common in studies on environmental education, although without a clear definition (DOS SANTOS, N. B., GOULD, 2018). This theme was highlighted by the following quote that describes the benefit gained by the interviewee from contact with the mangrove:

> "For me, the benefit of the mangroves is the relationship with the environment [...] more in the sense of belonging. When I came to live in this neighborhood, we had a larger mangrove area. So, I had greater contact with the environment and even with the life in that space, crabs, and everything. So that was very rich for me." (G., interviewed).

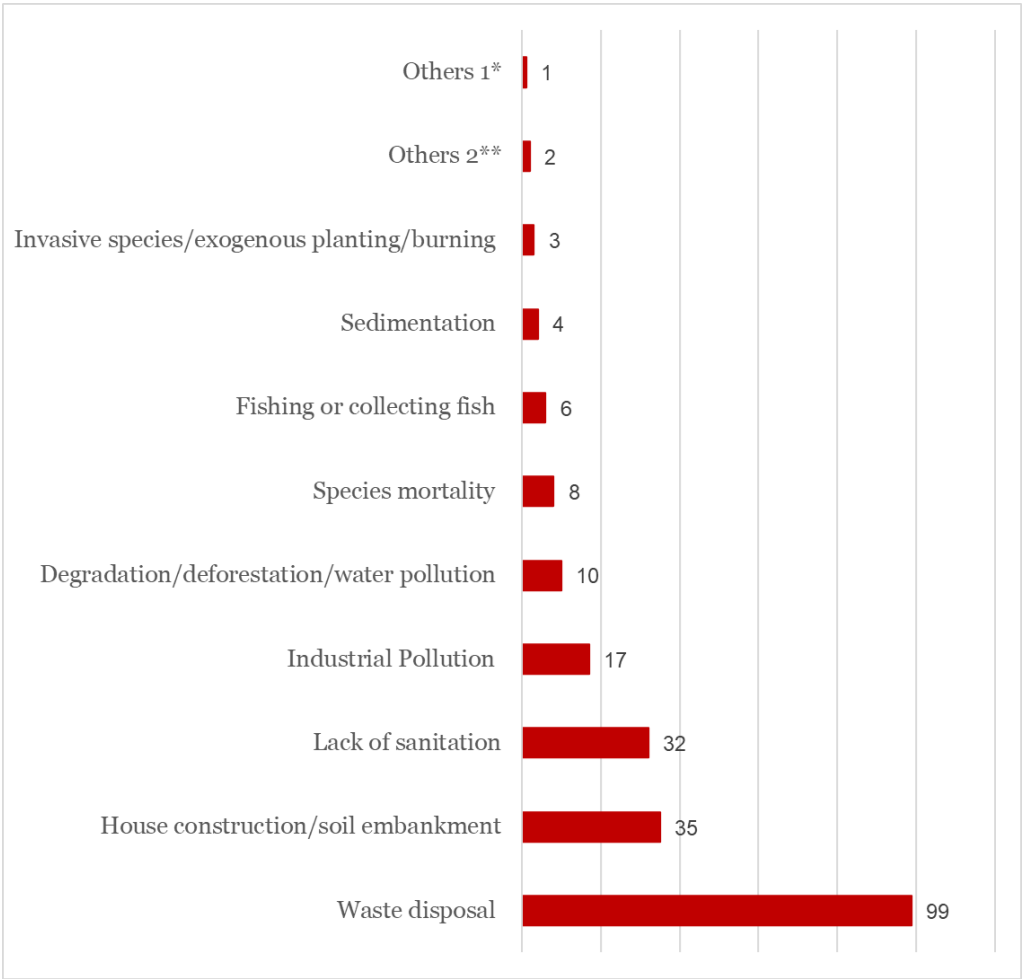
In relation to other SEs mentioned by the population, the issue of the mangrove territory (and surroundings) was perceived as a driving space for economic development and housing for the population by only one individual. This perception, though in minority in the sample, reflects the historical and predominant development model of the region that has resulted in the invasion, regularization, and concession of mangrove areas for real estate speculation and large projects (CRISTOFOLINI, 2013; GERHARDINGER et al., 2021; SOUZA, 1991).

1.2 Impacts Perception

The content analysis revealed several illegal issues in the use and occupation of the mangrove territory that are perceived by the coastal population. Waste disposal was the impact most frequently mentioned by the population (99 citations by all individuals), followed by the construction of houses/landfill (35 citations), as shown in Figure 3. It is possible that waste disposal was more cited due to interviewees widely reporting evidence of waste, garbage, litter, among others disposal observed in the mangrove

environment. Regarding the perception of house construction and soil embankment as degrading impacts, it is believed that knowledge of the history of land occupation of the region, especially regarding encroachment and illegal housing developments contributed to these mentions.

Figure 3: Absolute frequency of degrading impacts on the mangrove identified by the studied population (N=53) through content analysis. The chart bars only include codes created from the mentioned main words.



Source: Created by the author (2023). Note: *: seafood cultivation, disposal of dead animals, water-course diversion, climate change. **: decrease in fishers' income; roads/trails/passages; non-belonging; air pollution.

The mangrove territory of the municipality of Joinville was intensively occupied in the 1970s due to the industrial and population growth of the municipality (MOSER,

1993). In the Boa Vista neighborhood and surrounding neighborhoods, illegal land uses (landfills and settlements) advanced further after the metallurgical industry moved to the neighborhood in 1954 (CRISTOFOLINI, 2013; SOUZA, 1991). Such land use developments also occurred due to the lack of housing policy to accompany the internal (within the municipality itself) and external (from other municipalities in SC and other states, mainly in the state of Paraná) expansion flow, as well as real estate speculation and financial incentives that occurred at the time these areas were becoming urbanized (SOUZA, 1991). This process caused significant losses of mangrove areas. However, soil embankment and the construction of houses have continued unabated, causing degrading impacts on the mangroves, as reported by the sampled population:

> "Interviewee: people build on the mangrove. Illegal constructions and landfills. Interviewer: "Do people still build on mangroves?" Interviewee: "They build. This area here, this street, was all mangroves in the past, but it has been drained and filled in" (J., interviewed).

> "[...] so the mangrove area was encroached upon. Drained, filled in and there are constructions, right? It's very difficult to see this, because the places where we passed by and saw the native plants, the birds, the crabs, today have been drained and there are houses, commercial establishments" (N., interviewed).

> "Joinvillenses, Joinvillense culture, is about looking at the mangrove and a river and seeing a way to cover it. And we did it the wrong way for many years. The result of this is the floods that we get every rainy day" (V., interviewed).

It is observed that despite the construction of a canal to contain invasions of the mangrove by the city hall, deforestation and degradation remain due to other socioeconomic factors, even as part of local culture. On the other hand, another participant regretfully reported that landfills have caused the destruction of the mangrove forest, comparing past and present. Before there was biodiversity (there were mangroves), but currently in these lands, mangroves have been replaced by other establishments. The 2018 Municipal Plan for the Conservation and Recovery of the Atlantic Forest presents a survey of the municipality's illegal urban real estate expansion and identified occupations in the mangroves (PMJ, 2018), confirming participants' observations.

Another degrading factor observed by the population was the lack of sanitation, which ranked third in the most frequently mentioned impacts (Figure 3). Currently, the municipality has only 39% of urban sewage service (INSTITUTO TRATA BRASIL, 2022). According to a survey by the *Viva Cidade Project*, less than 15% of houses in the Boa Vista and Comasa neighborhoods have a public sewage system, with around 85% of houses still relying on a septic tank (PMJ, 2011).

Moreover, a new classification that was not the focus of this research emerged, i.e., impacts considered positive by the population on the mangrove. Some interviewees

mentioned that fencing the mangrove would have a positive impact, as it would prevent waste disposal (eight mentions). Some respondents mentioned that the planting of flowers and vegetable gardens in the mangrove forest was also mentioned as positive sign of "care for the environment". It is not possible to say whether the plantations occurred in areas that were already degraded or were degraded for this purpose, but twelve positive mentions of these activities were reported, some of which are as follows:

> "While some take care of it, plant some little things, others do exactly the opposite" (V., interviewed).

> "There are negative impacts, but, on the other hand, there are other people who take great care of that region. They plant and have vegetation, flowers." (F., interviewed).

> "(..) some time ago, the residents here on this mangrove border, they wanted to make it look nice. They planted bananas, they planted some lemon trees, some guava trees. There's a colleague of mine who even built, like, a flowerbed of flowers on the border. It was something very beautiful" (Z., interviewed).

What some individuals may consider a negative impact can be a positive action that can help preserve the mangrove forest from greater interference, beautify the place and generate food (by planting fruit trees and vegetables). One participant reported the contrast of negative and positive feelings generated by the disposal of rubbish and domestic waste and by gardens, as per the following speech:

> "Dirt, debris. I don't like seeing it, it makes me upset. I like seeing the vegetable garden that the residents create. They try to use the area better." (C., interviewed).

However, it is not possible to say whether the participant's understanding of the use of space means a sustainable use of the area. Therefore, contracting interpretations of the meaning and power of the mangroves to people and society can be drawn: a) a territory delimited and controlled, in most cases, by the political power of the State, thus a "space-power" defined by legal-political relations; b) a cultural territory, as the product of a symbolic dimension and more subjective appropriation/valuation of an area by a certain group; c) an economic territory conceived as a source of resources or incorporated into the capital-labor relations of social classes (HAESBAERT, 2016); d) a sustainable territory that brings to light discussions about environmental sustainability and local development (SAQUET, 2020).

Conclusion

The study concluded that the studied population perceives more easily the cultural ecosystem services of the mangroves, especially the benefits related to leisure. It was observed that there is a demand for new leisure spaces in the region and the creation of green areas in the neighborhoods studied could supply this, as well as the creation of ecological parks around the mangrove forest. Precautions are however necessary to develop tourism in mangrove areas to prevent the negative impacts it could have on the ecosystem. Provision ES were the second most cited, even though most of the respondents were not direct users of fishing resources, although there is evidence of a coastal urban population that uses them. It is necessary to evaluate the environmental quality of these resources given the reports of several degrading factors in the ecosystem.

Illegal construction in mangrove areas, lack of sanitation, and incorrect waste disposal were the degrading factors most mentioned by the population, which shows the need to increase basic sanitation in the region and environmental education policies to raise awareness about the correct disposal of garbage and the preservation of the ecosystem. Moreover, awareness about permitted and prohibited uses of mangroves must be reinforced as some degrading impacts on the mangroves were assessed as positive by the population.

This study highlights bottlenecks that public managers need to review and discuss with the population for the development and adaptation of public policies, such as land use and occupation in the mangrove territory and surrounding areas. Additionally, it is recommended that future studies include the environmental perception of traditional and indigenous communities that were not represented in this study, as these populations have sociocultural singularities and attribute different meanings to nature from the predominant Western view. Only in this way will the formulation of truly inclusive public policies be possible.

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References

AFONSO, F. et al. Assessing Ecosystem Services in Mangroves: Insights from São Tomé Island (Central Africa). **Frontiers in Marine Science.** v. 9, n. February, p. 1–16, 2021.

ALONGI, D. M. et al. Influence of human-induced disturbance on benthic microbial metabolism in the Pichavaram mangroves, Vellar – Coleroon estuarine complex, India. **Marine Biology**, v. 147, p. 1033–1044, 2005.

AUGUSTO, F. et al. Use of carbon and nitrogen stable isotopes to study the feeding ecology of small coastal cetacean populations in southern Brazil. **Biota Neotropica**, v. 13, n. 4, p. 90–98, 2013.

BARDIN, L. **Análise de conteúdo**. São Paulo: Edições 70, 2011. 279 p. BOEING, M. et al. Occurrence of intersexuality in Mugil curema from an estuary of the North coast of Santa Catarina, Brazil – case report. **Arq. Bras. Med. Vet. Zootec.**, v. 75, n. 1, p. 117–121, 2023.

CARRANZA, G. O. et al. Vulnerability of human communities in Mexican mangrove ecosystems: an ecosystem-based adaptation approach. **Investigaciones Geográficas**, v. 95, n. abril. p. 1-18, 2018.

CHAN, K. M.; GOULD, R. K.; PASCUAL, U. Editorial overview: Relational values: what are they, and what's the fuss about? **Current Opinion in Environmental Sustainability**, v. 35, p. A1–A7, 2018.

CREMER, M.J., SIMÕES-LOPES, P. C. The occurrence of Pontoporia blainvillei (Gervais & d'Orbigny) (Cetacea, Pontoporiidae) in an estuarine area in southern Brazil. **Revista Brasileira de Zoologia**, v. 22, n. 3, p. 717–723, 2005.

CREMER, M. J.; SARTORI, C. M.; SCHULZE, B. First record of an anomalously colored franciscana dolphin, Pontoporia blainvillei. **Anais da Academia Brasileira de Ciências.** Academia Brasileira de Ciências, v.86, p. 1221-1225, 2014.

CRESWELL, J. W.; CLARK, V. L. P. **Pesquisa de Métodos Mistos: Série Métodos de Pesquisa**. Porto Alegre: Penso Editora, 2015.

CRISTOFOLINI, Nilton José. **Desenvolvimento socioeconômico de Joinville/SC e a ocupação dos manguezais do bairro Boa Vista**. 2013. Tese (Doutorado em Geografia) - Programa de Pós-Graduação em Geografia, Universidade Federal de Santa Catarina, Florianópolis, 2013.

DÍAZ, S. et al. The IPBES Conceptual Framework - connecting nature and people. **Current Opinion in Environmental Sustainability**, v. 14, p. 1–16, 2015.

DONNELL, K. L. O.; TOMICZEK, T.; SCYPHERS, S. B. Resident Perceptions and Parcel-Level Performance Outcomes of Mangroves, Beaches, and Hardened Shorelines After Hurricane Irma in the Lower Florida Keys. **Frontiers in Marine**, v.10, n. March, p. 1–10, 2022.

DORJI, T. et al. Socio-cultural values of ecosystem services from Oak Forests in the Eastern Himalaya. **Sustainability**, v. 11, n. 8, p. 1–20, 2019.

DOS SANTOS, N. B., GOULD, R. K. Can relational values be developed and changed? Investigating relational values in the environmental education literature. **Current Opinion in Environmental Sustainability**, v. 35, p. 124–131, 2018.

EJF - Environmental Justice Foundation. **Mangroves: Nature's defence against Tsunamis— A report on the impact of mangrove loss and shrimp farm development on coastal defences.** London: EJF, 2006. 33 p.

FATMA - Fundação do Meio Ambiente. **A Baía da Babitonga**. Joinville: FATMA, 1984. 35p.

FELDHAUS JR., A. et al. Melastomataceae das ilhas da Baía Babitonga, Santa Catarina, Brasil. **Rodriguésia**, v. 71, p. 1-14, 2020.

FINK, Daniela. **Aspectos reprodutivos, alimentares e zoonóticos do guará (*Eudocimus ruber*) (Pelecaniformes, Threskiornithidae) na Baía Babitonga, Santa Catarina.** 2018. Tese (doutorado) – Programa de Pós-graduação em Saúde e Meio Ambiente, Universidade da Região de Joinville, Joinville, 2018.

FINK, D.; CREMER, M. J. The return of the Scarlet Ibis: First breeding event in southern Brazil after local extinction. **Revista Brasileira de Ornitologia**, v. 23, n. 4, p. 385–391, 2015.

FREITAS, H. et al. O Método de pesquisa Survey. **Revista de Administração**, v. 35, n. 3, p. 105–112, 2000.

GALVÃO, J. R., TEDESCO, C. D. Contribuições da percepção ambiental para a sustentabilidade na zona de amortecimento de unidade de conservação. **Ambiente & Sociedade**, v. 25, p.1-23, 2022.

GERHARDINGER, L.C. et al. Diagnóstico socioambiental do Ecossistema Babitonga. **Revista CEPSUL - Biodiversidade e Conservação Marinha**, v. 10, p. 1-176, 2021.

GIL, A. C. **Métodos e técnicas de pesquisa social**. 7ª ed. São Paulo: Editora Atlas S.A., 2019. 248 p.

GROSE, Alexandre Verson. **O guará *Eudocimus ruber* (AVES: Threskiornithidae) no estuário da Baía da Babitonga, litoral norte de Santa Catarina: repovoamento, distribuição e biologia**. 2016.Tese (Doutorado em Ciências Biológicas) - Programa de Pós-Graduação em Ciências Biológicas – Zoologia, Universidade Federal do Paraná, Curitiba, 2016.

GROSE, Alexandre Verson. V.; FINK, D.; CREMER, M. J. Revisão bibliométrica de estudos da avifauna no Ecossistema Babitonga, Santa Catarina, Brasil. **Revista CEPSUL - Biodiversidade e Conservação Marinha**, v. 8, p. 20, 2019.

GUEK-NEE, K. et al. Influence of mangrove forests on subjective and psychological wellbeing of coastal communities: Case studies in Malaysia and Indonesia. **Frontiers in Public Health**, v. 10, p. 1-12, 2022.

HAESBAERT, R. **O mito da desterritorialização: do "fim dos territórios" à multiterritorialidade**. 10. ed. Rio de Janeiro: Bertrand Brasil, 2016. 396 p.

HERBST, Dannieli Firme. **Percepções e dimensões espaciais do uso dos serviços ecossistêmicos: subsídios para análise de risco e gestão do Ecossistema Babitonga**. 2020. Tese (Doutorado em Ecologia) - Programa de Pós-Graduação em Ecologia, Universidade Federal de Santa Catarina, Florianópolis, 2020.

HERBST, D. F.; GERHARDINGER, L. C.; HANAZAKI, N. Linking User-Perception Diversity

on Ecosystems Services to the Inception of Coastal Governance Regime Transformation. **Frontiers in Marine Science**, v.7, n. February, p. 1-15, 2020.

IBAMA - INSTITUTO BRASILEIRO DO MEIO AMBIENTE E DOS RECURSOS RENOVÁVEIS. **Proteção e controle de ecossistemas costeiros: manguezais da Baía de Babitonga**. Coleção Me ed. Brasília (DF), Itajaí (SC): IBAMA/CEPSUL, 1998. 145 p.

IBGE - INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. **Cidades e dados**. Disponível em: <https://www.ibge.gov.br/cidades-e-estados/sc/joinville.html>. Acesso em: 18 nov. 2020.

ICMBIO - Instituto Chico Mendes de Conservação da Biodiversidade. **Atlas dos Manguezais do Brasil**. Brasília: Instituto Chico Mendes de Conservação da Biodiversidade, 2018. 176 p.

INSTITUTO TRATA BRASIL. **RANKING DO SANEAMENTO INSTITUTO TRATA BRASIL 2022 (SNIS 2020)**. São Paulo: Instituto Trata Brasil, 2022.130 p.

IPBES - INTERGOVERNMENTAL SCIENCE-POLICY PLATFORM. **The global assessment report on Biodiversity and Ecosystem Services**. Bonn: IPBES secretariat, 2019. 1148 p.

KOHLSDORF, E. M. Brasília em três escalas de percepção. In: DEL RIO, V.; DE OLIVEIRA, L. (org.). **Percepção ambiental: a experiência brasileira**. 2. ed. São Paulo: Studio Nobel, 1999. 287 p.

LIMA, R. C.; BASTOS, A.V.B. Governança, Instituições e Sustentabilidade: Estudos de Caso em Territórios Rurais. In: TAVARES, G.; FERREIRA, A.(org.), **Gestão Ambiental e Desenvolvimento Sustentável.** Editora CRV. Curitiba, 2019. 89-104 p.]

MMA - Ministério do Meio Ambiente. **2ª atualização das áreas prioritárias para a conservação da biodiversidade 2018**. Disponível em: <https://www.gov.br/mma/pt-br/assuntos/servicosambientais/ecossistemas-1/conservacao-1/areas-prioritarias/2a-atualizacao-das-areas-prioritarias--para-conservacao-da-biodiversidade-2018>. Acesso em: 4 abr. 2023.LYNCH, K. **A imagem da cidade**. 3. ed. São Paulo: Editora WMF Martins Fontes, 2011. 240 p.

MEA - MILLENNIUM ECOSYSTEM ASSESSMENT. **Ecosystems and Human Well-being: Synthesis.Island Press**. Washington: MEA, 2005.1148 p.

MOSER, Liliane. **Como o mangue virou cidade: um estudo sobre condições de vida e a organização institucional do espaço urbano nas áreas de mangue em Joinville/SC.** 1993. Dissertação (Mestrado em Sociologia Política) - Pós-graduação em Sociologia Política, Universidade Federal de Santa Catarina, Florianópolis, 1993.

NOVAK, Alessandra. **Percepção da qualidade ambiental de pescadores tradicionais e a investigação da contaminação de moluscos por enterobactérias resistentes a antibióticos, uma abordagem "One Health"**. 2023. Tese (Doutorado em Saúde e Meio Ambiente) – Programa de Pós-graduação em Saúde e Meio Ambiente, Universidade da Região de Joinville, Joinville, 2023.

OKAMOTO, J. **Percepção ambiental e comportamento: visão holística na arquitetura e na comunicação**. 2. ed. São Paulo: Editora Mackenzie, 2014. 183 p.

OLIVEIRA-NETO, J.F. et al. Local distribution and abundance of Cardisoma guanhumi Latreille , 1928 (Brachyura : Gecarcinidae) in southern Brazil. **Brazilian Jornal of Biology**, v. 74, n. 1, p. 1–7, 2014.

PMJ - Prefeitura Municipal de Joinville. Secretaria de Agricultura e Meio Ambiente. **Plano Municipal de Conservação e Recuperação da Mata Atlântica do Município de Joinville/SC**. Joinville: SAMA, 2018. 137 p.

PMJ - Prefeitura Municipal de Joinville. Secretaria de Planejamento Urbano e Desenvolvimento Sustentável. **Joinville Cidade em dados 2020 Ambiente Natural**. Joinville: SEPUD, 2020. 22 p.

PMJ - Prefeitura Municipal de Joinville. Secretaria de Planejamento Urbano e Desenvolvimento Sustentavél de Joinville. **Joinville Bairro a bairro 2017**. Joinville: SEPUD, 2017. 188 p.

PMJ - Prefeitura Municipal de Joinville. **Plano de Educação Ambiental, através de Comunicação Social e Mobilização Pública no Âmbito do Projeto Viva Cidade - diagnóstico das ações em andamento no município.** Joinville: Ecologus/CECIP, 2011. 119 p.

PINHEIRO, L.; CREMER, M. J. Sistema pesqueiro da Baía da Babitonga, litoral norte de Santa Catarina: uma abordagem etnoecológica. **Desenvolvimento e Meio Ambiente**, v. 8, p. 59–68, 2003.

RAYMOND, C. M. et al. Mapping community values for natural capital and ecosystem services. **Ecological Economics**, v. 68, n. 5, p. 1301–1315, 2009.

RODRIGUES, A. M. T. et al., **Reserva da Babitonga**. CEPSUL - CMA- Sul - FURG - UNIVILLE – VidaMar, 2005. 27 p.

ROSS, P. M. Macrofaunal loss and microhabitat destruction: The impact of trampling in a temperate mangrove forest, NSW Australia. **Wetlands Ecolgy and Management**, v. 14, p. 167–184, 2006.

SANDILYAN, S., KATHIRESAN, K. Mangrove conservation: a global perspective. **Biodiversity Conservation**, v. 21, p. 3523–3542, 2012.

SANDILYAN, S., THIYAGESAN, K.; NAGARAJAN, R. Ecotourism in wetlands causes loss of biodiversity. **Current Science**, v. 95, n. 11, p. 1511, 2008.

SAQUET, M. A. **Abordagens e concepções de território**. 5. ed. Rio de Janeiro: Consequência editora, 2020. 224 p.

SOUZA, L. A. DE. **O processo de ocupação das áreas de mangues em Joinville: agentes, estratégias e conflitos.** Dissertação (mestrado) - Universidade Federal de Santa Catarina. Centro de Filosofia e Ciências Humanas Florianópolis, 1991.

SPALDING, M. **World atlas of mangroves**. 1. ed. Londres: Routledge, 2010. 336 p.

SPALDING, M. et al. **Mangroves for coastal defence**. Wetlands I ed. Cambridge: Wetlands International and The Nature Conservancy, 2014. 42 p.

UNEP-WCMC - United Nations Environment Programme World Conservations Monitoring Centre . **In the front line: shoreline protection and other ecosystem services from mangroves and coral reefs.** Cambridge: UNEP-WCMC, 2006. 33 p.

UNEP - UNITED NATIONS ENVIRONMENT PROGRAMME. **The Importance of Mangroves to People: A Call to Action**. Cambridge: United Nations Environment Programme World Conservation Monitoring Centre, 2014. 128 p.

VREESE, R. et al. Social mapping of perceived ecosystem services supply – The role of social landscape metrics and social hotspots for integrated ecosystem services assessment, landscape planning and management. **Ecological Indicators**, v. 66, p. 517–533, 2016.

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AMBIENTE & SOCIEDADE 25 anos 25 años 25 years

SciELO

Percepção ambiental dos serviços ecossistêmicos e impactos degradantes ao manguezal pela população urbana, Baía Babitonga-Brasil

Juliana da Motta Bustamante
Rodolfo Coelho Prates
Marta Jussara Cremer

Resumo:
Os manguezais da Baía Babitonga são ricos ecossistemas provedores de inúmeros serviços ecossistêmicos (SE). Tal reconhecimento é fundamental para a sua preservação. Contudo, diversas ameaças afetam a oferta desses SE. Com o objetivo de analisar a percepção ambiental da população urbana costeira quanto aos SE do manguezal e os impactos degradantes ao ecossistema, aplicaram-se questionários com moradores de bairros que sofreram perdas históricas de manguezais no município de Joinville - SC, Brasil (Boa Vista e Comasa). Análises quantitativas e qualitativas (análise de conteúdo) foram realizadas. Os resultados apontam que os serviços culturais (lazer) e de provisão foram os mais percebidos pela população, assim como, o descarte de resíduos, o aterramento do manguezal e a falta de saneamento. Assim, evidencia-se a necessidade da implantação de ações de educação ambiental, saneamento básico e espaços de lazer para amenizar as pressões na zona úmida costeira estudada.

Palavras-chave: Ecossistemas costeiros; serviços ambientais; usuários indiretos; percepção; degradação ambiental; análise de conteúdo.

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Artigo Original

AMBIENTE & SOCIEDADE 25 anos 25 años 25 years

SciELO

Percepción ambiental de los servicios ecosistémicos e impactos degradantes del mangle por parte de la población urbana, Baía Babitonga-Brasil

Juliana da Motta Bustamante
Rodolfo Coelho Prates
Marta Jussara Cremer

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Artículo Original

Resumen: Los manglares de Baía Babitonga son ecosistemas ricos que brindan numerosos servicios ecosistémicos (SE). Tal reconocimiento es fundamental para su preservación. Sin embargo, varias amenazas afectan el suministro de estos SE. Con el objetivo de analizar la percepción ambiental de la población urbana costera sobre el SE del manglar y los impactos degradantes sobre el ecosistema, se aplicaron cuestionarios a residentes de barrios que sufrieron pérdidas históricas de manglares en el municipio de Joinville - SC, Brasil (Boa Vista y Comasa). Se realizaron análisis cuantitativos y cualitativos (análisis de contenido). Los resultados indican que los servicios culturales (ocio) y provision son los más percibidos por la población, así como, la disposición de desechos, el vaciamiento del manglar y la falta de saneamento. Así, destaca la necesidad de implementar la educación ambiental, el saneamiento básico y la creación de espacios de esparcimiento para aliviar la presión sobre el humedal costero estudiado.

Palabras-clave: Ecosistemas costeros; servicios ambientales; usuarios indirectos; percepción; degradación ambiental; análisis de contenido.