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Environmental sustainability in fishing communities within tourist destinations: the case of Mem de Sá Island - Brazil

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Abstract

Objective: Evaluate the environmental sustainability of the community of Mem de Sá Island in Sergipe, Brazil, based on sustainability indicators concerning social, economic and natural aspects.
Methodology: It was carried out following the model for assessing the sustainability of fishing communities in tourist destinations, described by Faxina (2014). The questionnaire was chosen as a data collection instrument where 64 representatives out of 75 families in the community were interviewed.
Originality/Relevance: The current work exhibits an environmental sustainability assessment tool for communities, which reduces the scale of analysis and allows to know the specific needs of small population groups.
Results: The community has reached a medium level of environmental sustainability, and the data reveal a lack of means of accessing information, public transportation and community organization. In addition, low diversity of job opportunities, lack of professional training, weaknesses in the collection and disposal of waste, and uneven distribution of water and energy were observed.
Theoretical/methodological contributions: The importance of small-scale sustainability assessment models was noticed, which can be useful resources for monitoring the development process, especially in cases where there is a new productive activity underway, which has the potential to cause negative environmental impacts unknown to the community.
Social/management contributions: The environmental sustainability assessment can be used as a planning and management tool in different instances of governance, especially by community leaders, encouraging empowerment and local participation, principles supported by Community-Based Tourism.

Keywords: Environment. Sustainable community. Artisanal fishing. Community-based tourism.

Sustentabilidade ambiental em comunidades de pescadores inseridas em destino turístico: o caso da Ilha Mem de Sá – Brasil

Resumo

Objetivo: Analisar a sustentabilidade ambiental da comunidade Ilha Mem de Sá, Sergipe, Brasil, com base em indicadores de sustentabilidade nas dimensões social, econômica e natural.
Metodologia: Teve como base o modelo de avaliação de sustentabilidade de comunidades de pescadores inseridas em destinos turísticos, elaborado por Faxina (2014). O questionário foi adotado como instrumento de coleta de dados e foram entrevistados 64 representantes das 75 famílias da comunidade.
Originalidade/Relevância: O trabalho apresenta uma ferramenta de avaliação de sustentabilidade ambiental para comunidades, o que reduz a escala de análise e permite conhecer as necessidades específicas de pequenos grupos populacionais.
Resultados: A comunidade atingiu nível médio de sustentabilidade ambiental, e os dados revelam carência nos meios de acesso às informações, no transporte público e na organização comunitária;

baixa diversidade de oferta de trabalho; carência de capacitação profissional; fragilidades na coleta e destinação de resíduos, e distribuição desigual de água e energia.
Contribuições teóricas/metodológicas: Constatou-se a importância dos modelos de avaliação de sustentabilidade em pequena escala, que podem ser ferramentas úteis de monitoramento do processo de desenvolvimento, especialmente nos casos onde há uma nova atividade produtiva em curso, que tem potencial de causar impactos ambientais negativos desconhecidos pela comunidade.
Contribuições sociais/para a gestão: A avaliação da sustentabilidade ambiental em tela pode ser utilizada como uma ferramenta de planejamento e gestão em distintas instâncias de governança, especialmente pelas lideranças comunitárias, estimulando o empoderamento e a participação local, princípios sustentados pelo Turismo de Base Comunitária.

Palavras-chave: Meio ambiente. Comunidade sustentável. Pesca artesanal. Turismo de base comunitária.

Sostenibilidad ambiental en comunidades pesqueras insertadas en destino turístico: el caso de la Isla Mem De Sá - Brasil

Resumen
Objetivo: Analizar la sostenibilidad ambiental de la comunidad Ilha Mem de Sá, Sergipe, Brasil, a partir de indicadores de sostenibilidad en las dimensiones social, económica y natural.
Metodología: Se basó en el modelo de evaluación de la sostenibilidad de comunidades pesqueras en destinos turísticos, elaborado por Faxina (2014). Se adoptó el cuestionario como instrumento de recolección de datos y se entrevistó 64 representantes de las 75 familias de la comunidad.
Originalidad/Relevancia: El trabajo presenta una herramienta de evaluación de la sostenibilidad ambiental para las comunidades, que reduce la escala de análisis y permite conocer las necesidades específicas de pequeños grupos poblacionales.
Resultados: La comunidad alcanzó un nivel medio de sostenibilidad ambiental y los datos revelan falta de medios de acceso a la información, transporte público y organización comunitaria; baja diversidad de la oferta laboral; falta de formación profesional; debilidades en la recolección y disposición de residuos y distribución desigual del agua y la energía.
Contribuciones teóricas/metodológicas: Se delimitó la importancia de los modelos de evaluación de la sostenibilidad en pequeña escala, los cuales pueden ser herramientas útiles para monitorear el proceso de desarrollo, especialmente en los casos en que existe una nueva actividad productiva en curso, la cual tiene el potencial de generar impactos ambientales negativos desconocidos por la comunidad.
Contribuciones sociales/para la gestión: Esta evaluación de la sostenibilidad ambiental puede ser utilizada como herramienta de planificación y gestión en diferentes instancias de gobernanza, especialmente por parte de líderes comunitarios, estimulando el empoderamiento y la participación local, principios apoyados por el Turismo Comunitario.

Palabras clave: Medio ambiente. Comunidad sostenible. Pesca artesanal. Turismo comunitario.

Introduction

Sustainability is a term that has been widely used in the most different spheres of society and territorial scales, being part of government plans and advertising campaign slogans. This popularity can be justified, somehow, by the influence of international events, such as the United Nations Conference on the Human Environment in Stockholm in 1972, and Eco Rio 92, which triggered several other events, affecting public policies and society about concerns with environmental issues.

In this context, sustainable tourism has been growing in popularity over the past thirty years as a development strategy (Mccool & Lime, 2001). The term sustainable development, which establish the environment as the limit of growth, was institutionally recognized in 1987,

through the report “Our Common Future”. For the World Commission on Environment and Development (WCED), Sustainable Development "is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (CMMAD, 1991, p. 46).

This concept has given rise to new instruments that have aided to change paradigms in recent decades, such as the Earth Charter, a declaration of basic principles regarding respect for the environment and development; and Agenda 21, an action plan with the goals universally accepted for the period after 1992, when it was instituted. The Global Agenda 21 started to guide the use of specific indicators to assess the sustainability of development, since indicators such as Gross National Product, levels of pollution or consumption of resources are not sufficient to measure it, a fact that highlights the need and guides the creation of sustainable development indicators (UNCED, 1992). In 2015, the document “Transforming Our World: The 2030 Agenda for Sustainable Development” was prepared, setting out seventeen sustainable development goals and 169 goals to be achieved, based on the millennium development goals (ONU, 2015).

Considering this scenario, a diversity of tools, methodologies and systems were developed to assess sustainability in different realities. Some of these tools are recognized internationally when it comes to assessing the development process, such as: the Ecological Footprint, whose objective is to calculate the area needed for the production of resources sufficiently destined to support a given community (Siche et al. 2007); the Dashboard of Sustainability method, which simulates a car dashboard and the dials point to the performance of the social, economic and environmental dimensions (Bellen, 2004); the Barometer of Sustainability, which combines indicators that can be concluded through the use of various data (Prescott-Allen, 1999); the Enviormental Sustainability Index (ESI), whose Environmental Sustainability Index enables a comparison among nations most conducive to promoting sustainable development; the Emergency Performance Index, which considers energy analysis as its matrix (Siche et al. 2007), and the Bellagio STAMP, which considers principles for assessing and measuring sustainability (Pintér et al. 2012).

According to Siena (2008, p. 360), several sets of indicators have been tested and improved, but there is no consolidated methodology. For the author, one of the gaps in these methodologies is in the aggregation of data, in “how to choose and prioritize or consider dimensions and aspects that, overall, express the result in a sustainable development index”.

Consequently, through interdisciplinary studies that evaluate the relationship between development and environment, this study aims to understand the human-nature interaction and evaluate the effects of this relationship on the community of Mem de Sá Island, municipality of Itaporanga D´Ajuda, Sergipe, in order to find the balance among the indexes of the social, economic and natural dimensions of sustainability.

For understanding purpose, the definition of community has a concept that is controversial and has a multiplicity of opinions and positions. Nevertheless, by common sense, it has a positive idea that can be easily associated with social organization and the common. According to Wirth (1973, p. 83), it must present “territorial base, distribution of men, institutions and activities, in space, a life together founded on kinship and economic interdependence, and an economic life based on mutual correspondence of interests”. In addition, the author adds that the experience in community is due to the things that men have in common.

Nisbet (1967, p. 48) highlights the community as a “fusion of feelings and thoughts, of tradition and commitment, of adhesion and volition. It can be found in, or symbolically express, locality, religion, nation, race, age, occupation, or crusade. Its archetype, both historically and symbolically, is the family, and in almost every type of true community the nomenclature of the family is important”.

Therefore, the idea of community adopted in this research had considered

> the common space where a group of people live, making it possible to identify the institutions that exercise power over this area, as well as the economic activities prevailing there. Thus, the common, which would result in the understanding of the community adopted here, would be the space, considering its physical-biological characteristics, the human constructions and the social relations that occur in it (Faxina, 2014, p. 34).

Talking about environmental sustainability in a community does not only require delimiting what a community is, but also what is meant by the environment. It is noteworthy that, over time, the concept that this term corresponds to the physical aspects that make up the habitat of living beings has dominated the scientific literature. With this in mind, for example, the Council on Environmental Quality (1997) states that environmental quality has come to mean drinking water, healthy ecosystem, healthy food, communities free of toxic products, safe waste management and restoration of contaminated environments. However, this idea has been undergoing changes that seek to insert in the conception of the environment the relationships that are established among the various components and living beings that occupy a certain space, as well as the living conditions of those who occupy the habitat.

If the literature on the environment produced in the first decade of the 21st century is considered, the idea that it is made up of a complex of elements covering various dimensions has become practically widespread. Thus, environmental sustainability involves at least three dimensions: social, economic and natural. (Cvelbar & Dwyer, 2013; Dias, 2003; Dwyer, 2005; Sachs, 1993; Stoddard, Pollard, & Evans, 2012). Therefore, when the purpose is to evaluate the level of environmental sustainability in a community, it is assumed that these

three dimensions must coexist.

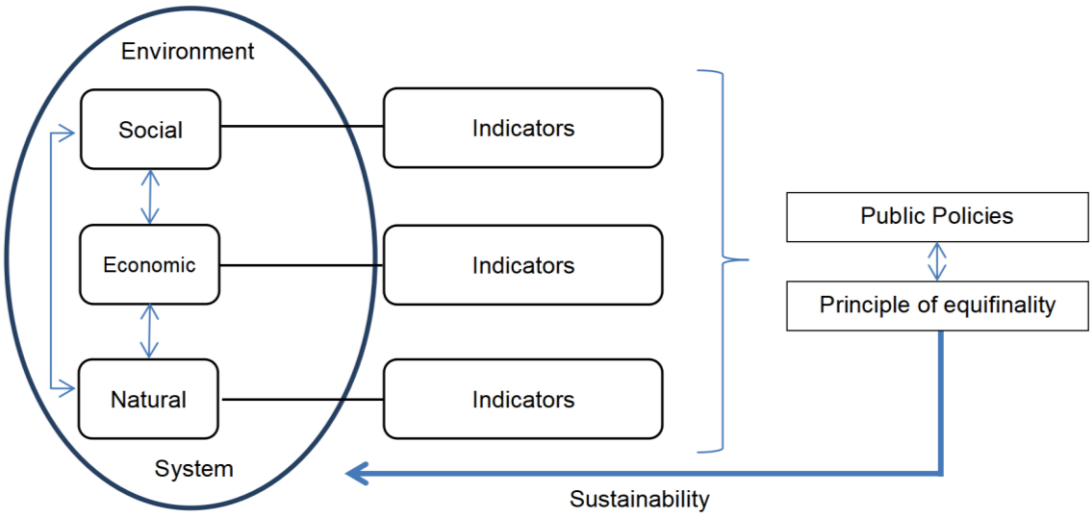
Bossel (1999) argues that sustainability is a dynamic concept, that societies, their environments, technologies, cultures, values and aspirations change. Thus, a sustainable society must sustain this change, and allow it to remain viable. This would be the meaning of sustainable development. However, the result of this adaptation cannot be predicted, even when the factors that limit or allow development are known. Despite the uncertainty of these results, it is necessary to define the indicators that can provide information about the viability of the system, in the case of this study, the community and its productive activities.

In this regard, considering the complexity required in environmental sustainability, the idea adopted to understand the reality will be through a systemic view, which considers the relationships among the parts of a major whole, where the parts cannot be analyzed without considering the whole. In the open system, interaction occurs not only within the system, that is, among the elements of the system, but also among other systems (Capra, 1996; Bertalanffy, 1975). A system, according to Bertalanffy (1975, p. 84), is “a complex of interacting elements”. The theorists of "systems" agree that the concept of "system" is not limited to material entities but can be applied to any totality constructed by interacting components.

On the subject of environmental sustainability, according to Faxina (2014), the principle of equifinality of open systems proposed by Capra (1996) and Bertalanffy (1975) also applies, where the final state - in this case, sustainability - can be reached by different initial conditions and different ways. Max-Neef, Elizalde and Hopenhayn (2010) add up that sustainability is complex, adaptive and can be achieved in different ways. Public policies can be these different ways to achieve sustainability. Nonetheless, knowing what emerging policies are to be programmed for this purpose depends on knowledge of the state of reality. And this state can be demonstrated through the assessment of environmental sustainability, where the use of indicators will allow to verify the result of each one of the specificities defined to make this reality operational (Faxina, 2014).

Figure 1 represents the idea of the systemic relationship among the dimensions of sustainability, which are operationalized by their specific indicators, which will serve as subsidies for public policies in favor of environmental sustainability.

Figure 1 – Systemic relationship among the dimensions of sustainability



Source: Faxina, 2014.

It is understood that environmental sustainability is systematically associated with the social, economic and natural dimensions. Then, the sustainability of one dimension interferes with the sustainability of another and, consequently, affects the whole, and therefore, the environmental sustainability (Faxina, 2014).

From this perspective, the key point of this research is to know the level of sustainability of the community of Mem de Sá Island as well as which indicators contribute negatively to this level, considering that the indicators with the worst performances are those that demonstrate which areas deserve priority actions. The evidence for assessing sustainability will take into account the profile of the community and its main productive activities. In this current case, it is a community of artisanal fishing inserted in a tourist destination, which has already benefited from external actions aimed at the development of tourist activity, given the potential it presents.

It is considered that such an evaluation constitutes a relevant mechanism in the construction of a sustainable development process from the grassroots, particularly in a community whose income sources of its residents originate from natural resources, such as the community in this study, where artisanal fishing and community-based tourism make up its main productive activities.

For this reason, the purpose of this assessment is precisely to identify the community's weak points, as well as to monitor its development, considering that a new economic activity (tourism) is emerging. The concern with the form of tourism development in the community is due to the fragility of its natural resources, as well as the local culture itself, where characteristics of traditional communities predominate. In accordance with Federal Decree Number 6.040 from February 7, 2007, in its article 3, item I, Traditional Peoples and

Communities are “culturally differentiated groups that self-identify as such, who have their own forms of social organization, that occupy and use territories and natural resources as a condition for their cultural, social, religious, ancestral and economic reproduction, relying on knowledge, innovations and practices generated and transmitted through tradition” (Brasil, 2007).

The type of tourism that is being developed in the community is Community-Based Tourism (CBT), which, according to Monkgogi (2015), has the potential to promote a sense of ownership of a community's resources, as well as its conservation and sustainable use. Mello, Silva and Faxina (2018) affirm that it is a path for the empowerment of communities and for them to learn to manage the problems and solutions of their own development. Giampiccoli and Saayman (2017) argue that alternative models of tourism, like this under study, have advanced more in the development of communities and in the reduction of poverty, when compared with the conventional model of tourism.

It is worth mentioning that tourism is an economic alternative for this community and CBT is the most appropriate management model for the local reality, especially because fishing, one of the main sources of income for the community, is a seasonal activity. However, the strategy adopted for the development of the CBT must be guided by the principles of sustainability, in attempt to guarantee the quality of life of residents, as well as the conservation of natural resources. The sustainability assessment then allows verifying the state of the community's reality, in order to guide decision making related to the community management itself, seeking to maximize the positive environmental impacts and minimize the negative ones.

Accordingly, the sustainability assessment can be used as a mechanism for public managers and the community itself to identify which are the primary actions to be developed, when preparing public policies, striving for social welfare, balanced use of natural resources and guarantee maintenance of environmental services. This assessment is important because it is a community of artisanal fishermen who essentially depend on natural resources for their survival and the local tourism, as an economic activity that has been developed more recently, also depends on these resources, which make up the local attractiveness. Furthermore, it will work as a planning and management tool, which will allow periodic assessments of the sustainability of local development.

Methodology

Characterization of the study area

Mem de Sá Island belongs to the municipality of Itaporanga D´Ajuda, Sergipe, which borders the city of Aracaju, the capital of the state. It is bordered by the Vaza-Barris river and

is inserted in the Environmental Protection Area of the South Coast of the state of Sergipe. This category of conservation unit, according to the National System of Conservation Units, is in the group of Sustainable Use Units, whose objective is to make conservation compatible with the sustainable use of natural resources (Brazil, 2000). During the data collection period, the community was made up of 75 households.

Moreover, the studied area is located in an estuarine region, composed of coastal lowland ecosystems such as Atlantic forest, sandbank and mangrove, which allowed the island's community to make a living through fishing and shellfish over the years, demonstrating the interaction of residents with local ecosystems (Souza, Braghini & Araújo, 2010). This interaction reflects the relationship that the community has with natural resources, as a material subsistence base.

Historically, the economic activities developed in the community are fishing and subsistence agriculture, flour production and, more recently, tourism (Silva & Faxina, 2019).

The importance of fishing is reflected in the local culture, as is the case of the Crab Festival, considered heritage by the community and the gastronomy, which is known for the dishes derived from fiddler crabs, red mangrove crabs, shrimps and fishes. Local culture and lifestyle, marked by traditional knowledge, characterize the identity of the community and add to the local tourist attractions, highlighting the close relationship between the productive activities of artisanal fishing and community-based tourism.

Another cultural aspect that should be mentioned is the “Samba de Coco” which, according to Mello, Silva and Faxina (2018), CBT stimulated the search for African cultural ancestry in the community and the performances of this dance, which was being forgotten in time, now also take place in cultural spaces in Sergipe, Brazil, and for tour groups that visit Mem de Sá Island. It appears that the CBT contributed to the local cultural rescue.

In addition to culture, the landscapes that make up the island's scenery, and boat trips are elements that add tourist potential to the community, arousing interest in visitors, especially in the ecotourism, nature tourism, gastronomic and cultural tourism segment.

It is observed that the productive activities developed in the community are strictly dependent on natural resources and therefore, their sustainable use is essential so that it can maintain its means of subsistence.

Methodological procedures

In order to achieve the general objective of this investigation, three steps were followed, whose methodological procedures will be described below. Firstly, the indicators that made up the model for assessing the sustainability of communities of artisanal fishermen inserted in tourist destinations were defined, as the area of this research was characterized.

Then, the model developed in the doctoral thesis entitled “Evaluation of the environmental sustainability of fishing communities in tourist destinations” by Faxina (2014) - in the Doctorate in Development and Environment, from the State University of Santa Cruz (UESC), Ilhéus, Brazil - was used as a reference.

In the model proposed by Faxina (2014), the theoretical foundation and environmental legislation were the main guidelines for the choice of indicators, which resulted in the identification of those that best represented and operationalized the social, economic and natural dimensions of sustainability.

For the current research, some adjustments to the indicators were made to better adapt to the studied reality. Such adjustments occurred with the participation of the community through workshops, in 2013, which sought to understand their demands regarding the quality of human life and natural resources, adopting a partially bottom-up approach. Finally, the theoretical principles used by Faxina (2014) were maintained and the variables, by dimension, were slightly adapted, as described in Table 1.

Table 1 – Dimensions of sustainability, respective variables and theoretical basis

Dimension	Variable	Theoretical basis
Social	Local identity, community organization, trust in authorities, safety, health, access to information and public transportation.	Theory of Social Capital (Coleman, 1988; Portes, 2000; Weber, 1973)
Economic	Income, work, professional qualification, reemployment, professional training.	Theory of Hstorical Materialism (Marx, 1978)
Natural	Waste sorting, destination of solid waste, collection of solid waste, access to drinking water, water distribution, energy distribution.	Ecological Modernization Theory (Spaargaren & Mol, 1999).

Source: Adapted from Faxina (2014).

The parameters for each indicator were organized on a scale of 1 to 5, which corresponds gradually to each indicator, according to the condition that started from the least acceptable (1) to the most acceptable (5) close to an ideal of sustainability. The score for each indicator was calculated using the arithmetic mean of the data collected with the field research. The sustainability index for each dimension was based on the arithmetic average of the result for each indicator and the level of environmental sustainability, based on the arithmetic average of the result for each dimension (Faxina, 2014).

Table 2 demonstrate the scale of the level of environmental sustainability.

Table 2 – Scale of the indices of the dimensions of sustainability and the level of environmental sustainability

Level of environmental sustainability	Absolute value
Very low	1,00 |—| 1,80
Low	1,80 —| 2,60
Medium	2,60 —| 3,40
High	3,40 —| 4,20

Very high	4,20 —|5,00

Source: Faxina, 2014.

Secondly, after adapting the model, it was structured in the form of a closed questionnaire and data collection was performed with the community. The census was carried out with the local population. Therefore, the person in charge of the family was considered the subject of this research, and in their absence, the second person responsible, and only one member per family answered the questionnaire. Considering that each family occupied a residence, the sample unit of this research was the residential home. Overall, 64 research subjects were interviewed, from September 2013 to February 2014, which represented 64 families. Few residences had no residents, even though after several trips that were made during the field research.

After data collection, they were tabulated in the Microsoft Excel 2010 program for further analysis. Lastly, the sustainability index in each of its dimensions - social, economic and natural - and the level of environmental sustainability of the community of Mem de Sá Island were determined.

Additionally, it was possible to identify which indicators had a negative impact on the level of environmental sustainability. With these results in hand, it became possible, then, to know which areas require improvement in the community. After evaluating the data, the results were reported to the community through a meeting with local leaders.

Results and discussions

In this session, the results of the evaluation of environmental sustainability of community of Mem de Sá Island in the social, economic and natural dimension will be presented. Table 3 shows the indicators that operationalized the social dimension, their respective average scores and the dimension index.

Table 3 – Indicator of environmental sustainability, by variable, in the social dimension and respective average scores, Mem de Sá Island, 2014

Variable	Indicator	Score
Local identity	Interest in continuing to reside in the community	3,88
Community organization	Participation in collective discussions	2,84
Trust in authorities	Compliance with community demands by public organizations	2,98
Safety	Tranquility and safety for children to play outside	4,86
Health	Health care system	3,67
Accessing information	Ability for an individual to seek, receive and impart information effectively	2,18
Public transportation	Opinion on access to public transportation	2,56

Social dimension Index	**3,28**

Source: Own source, 2014.

As can be observed in Table 3, only one of the indicators demonstrated very high performance, which was related to safety in the community, measured through the feeling of tranquility and safety for children to play outside. It is believed that this feeling is favored by the ties of kinship and friendship among residents, as it is a small community and because of their island location, which limits the access of non residents people.

The second indicator with the best performance was related to local identity, verified by the interest of the interviewees to continue living in the community, reaching a score of 3.88. It is worth mentioning that the local identity is very important when considering community-based tourism development, as it is one of the factors that will ensure the authenticity of the local attractiveness.

Both the feeling of safety and the local identity, indicators with greater performances in the social dimension, reinforce the interpersonal and “common” ties that characterize this village with as community, indeed.

On the other hand, some indicators revealed low performances. The worst result was exhibited by access to information (2.18), which indicates the limitation of the ways in which the community accesses information, followed by the opinion on access to public transportation (2.56) and organization community, measured through participation in collective discussions (2.84).

The community of Mem de Sá Island is not benefited by public transportation. Because it is an island, its residents face difficulties to move to other locations, such as to the headquarters of the municipality to which they belong. The most economical way is by boat to Porto dos Caibros, in Itaporanga D´Ajuda, which takes approximately ten minutes, although from this port to the urban area there is no public transportation. There is also another way of crossing to “Orla Pôr do Sol”, located in the municipality of Aracaju, capital of Sergipe, which is widely used by visitors arriving in the community. This place is served by public transportation, despite the journey is more costly and time consuming, lasting approximately forty minutes. This “isolation” hampers the daily lives of the community's residents and, even, the disposal of fish, which is one of the main sources of local income.

Concerning participation in collective discussions, an indicator that also performed poorly, Jacobi (1999, p. 37) suggests it to be an “important instrument for strengthening civil society, as the overcoming of accumulated needs depends basically on interaction between public and private agents, within the framework of strategic institutional partner arrangements”.

Participation as an indicator of community organization, is significantly important to be evaluated, as it is one of the principles of CBT (Faxina & Freitas, 2020; Lindström & Larson,

2016; López-Guzmán et al., 2011; Lucchetti & Font, 2013). Through it, it is possible to mitigate conflicts of interest inherent to the neoliberal free market model, and, when guided by ethical values, it determines the philosophy of sustainable tourism planning and contribute to the construction of sustainable locations, especially with regard to continuous assessment developed actions (Burns, 2004; Gunn & Var, 2002; Hall, 2008).

Consequently, the low level of participation reflects, somehow, the extent to which the demands of the community are met by the government, another indicator that showed an average performance (2.98). These data reveal the need to improve local participation, which would occur through the existence and / or effectiveness of local governance bodies, such as associations and cooperatives. The weakness of the community organization was also revealed in other communities that have CBT initiatives at different stages of evolution, such as the community of Pontal (Faxina & Freitas; 2020) and the community of Terra Caída (Faxina & Freitas, 2021), located in the municipality of Indiaroba, Sergipe, the same state where the area of this study takes place.

Although the health care system has achieved an average performance (3.67), the geographical characteristics of the community call attention to this result, especially due to the "isolation" of the population and the precarious transportation options that exist there, which can aggravate in emergency situations.

The social dimension index (3.28) indicated that there are weaknesses that can be identified by the indicators that reached the lowest performances, as previously stated. In this context, it is important that public policies oriented to the area of this study prioritize the improvement of access to information, public transportation, and stimulate the strengthening of the community organization. With regard to this last variable, it is emphasized that, through the institution of cooperatives and associations, which are models of community organization, it is possible to strengthen the productive activities developed by the community, such as artisanal fishing and community-based tourism. According to Mohamad and Hamzah (2013), a community cooperative effectively manages the economic, socio-cultural and environmental aspects of the local population.

Considering the economic dimension, its indicators and respective average scores, as well as the dimension index are shown in Table 4.

Table 4 – Indicator of environmental sustainability, by variable, in the economic dimension and respective average scores, Mem de Sá Island, 2014

Variable	Indicator	Score
Family income	Average of family income	3,43
Work	Search for paid activities	3,89
Reemployment	The condition of being easily reemployed	1,56

Professinal trainning	Participation in professional training courses	1,77
Economic dimension Index		**2,67**

Source: Own source, 2014.

It is noted in Table 4, that the indicator of the economic dimension with the highest performance (3.89) was that related to work, measured through the search for paid activities. This indicator reflects that the interviewees and their families, for the most part, are able to occupy themselves with the activities offered in the community itself. On the other hand, the indicator that presented the worst performance was the reemployment (1.56), which indicates the local limitation in the diversity of job offers and other paid occupations. This indicator measures the interviewee's perception of how easy it is to change jobs, or, if they were unemployed, they would find another job easily.

These findings may be related to the traditional character of the productive activities developed in that area, which are taught from father to son over generations, like fishing and agriculture, always focusing on activities and limiting their diversity. If, on the one hand, it retains tradition, on the other hand it limits the supply of work. However, tourism, which is contemporary in the community, stands out as an alternative to diversify the job offer, complement income and enhance these traditional activities. This idea corroborates with Giampiccoli and Kalis (2012), when stating that poor families in rural areas meet their needs through a combination of livelihood strategies, and CBT is seen as an additional means of meeting these needs.

The second indicator with the best performance (3.43) was family income, characterized mainly by occupation with artisanal fishing and shellfish and also considered benefits from government programs, such as those of income transfer (for instance, Bolsa Família Program) and retirement.

When it comes to professional training, the indicator with the second worst performance (1.77), it appears that it is one of the bottlenecks when thinking about preparing for the job market. Although there are reports that some courses have already been offered in the community, there is a need for continuity in this offer, since many have not participated in any of these courses in the past five years. On top of that, for the community to undertake tourism, even in the community-based management model, professional training is essential to prepare it to optimize positive impacts, and at the same time, protect it from the risks involved in all the dimensions of sustainability. According to Gascón (2013), if communities do not have a basis for making decisions according to their interests, these training actions will always be scarce, given the complexity of tourism.

The decision-making process is directly related to the instances of local governance, which depends on the community organization and the creation of a participatory environment, where the interests and expectations of the community may occupy the

agendas of discussion and claim. Therefore, observing what Gascón (2013) says, it is possible to verify a relationship between average community participation and low professional training.

Evaluating the index reached by the economic dimension (2.67), it is remarkable that there are vulnerabilities, and to know them just observe which indicators have reached the lowest performances. In this aspect, public policies aimed at the community of Mem de Sá Island should prioritize diversity in the supply of work, which can be developed with more incentives for tourist activity, as already mentioned, and the promotion of professional training actions.

Table 5 represents the indicators that compose the natural dimension, their respective average scores and the dimension index.

Table 5 – Indicator of natural sustainability, by variable, in the natural dimension and respective average scores, Mem de Sá Island, 2014

Variable	Indicator	Score
Waste sorting	Waste sorting practice	3,8
Disposal of solid waste	Waste's final destination	1,0
Solid waste collection	Frequency of garbage collection	1,02
Access to drinking water	Water supply mode	3,18
Water distribution	Frequency of water shortage	2,83
Electricity distribution	Frequency of power failure	2,67
Natural dimension Index		**2,42**

Source: Own source, 2014.

As described in Table 5, only one indicator displayed high performance, which was related to the waste sorting, measured through the practice of selecting residual material in homes, reaching a score of 3.8. The second indicator with the best performance was related to access to drinking water, verified by the way water is provided in homes, which reached a score of 3.18.

The indicators related to solid waste were the ones that presented the lowest performances. The waste's final destination reached the lowest possible score, 1.0, followed by the frequency in which such garbage is collected, whose score was 1.02. The community of Mem de Sá Island does not have access to daily household waste collection. Domestic waste is deposited in containers and is eventually taken by boats, by the residents themselves, to Porto dos Caibros, where it is collected by the city collection service. The estimated frequency for this collection is weekly, according to information provided by the interviewees.

Garbage collection allows for considerable improvement in environmental quality and is essential for the protection of the health of the community and its surroundings, reducing cases of disease. However, it is not enough to extinguish effects arising from the inappropriate destination of garbage, such as the contamination of natural resources. Due to the absence of a daily collection service, the interviewees reported that part of the garbage is burned and / or deposited in vacant lots and water bodies. Such practices are inadequate and alarming because they generate negative environmental impacts, which can compromise the conditions of the natural resources used as a source of subsistence for the community itself. In addition to the contamination of natural resources, visual pollution, caused by inadequate waste disposal, is a negative impact that compromises the aesthetics of the community, which can interfere with local tourist attractiveness. The periodic collection and proper disposal of garbage are fundamental for the preservation of the environmental quality and health of the community.

The analysis of these data, associated with the interviewees' reports, allows the inference that the waste sorting, which proved to be the indicator with the best performance in this dimension, occurs in order to reduce the volume that is destined to the collection service. Having said that, part of the paper and other materials is burned, as well as part of the organic waste is dumped in the soil, mangrove and river.

The frequencies of lack of water and energy (2.83 and 2.67 respectively) were indicators that reached average scores, indicating insufficiency in the infrastructure for the distribution of these resources to the homes. With regard to water, some residents reported that they go for days without supplies, having to fetch water from community cisterns, although they are not always clean for consumption. Simultaneously, other local individuals reported that they buy mineral water at the town's headquarters despite high cost.

Overall, among the three dimensions evaluated in this study the natural sustainability indicator reached the lowest sustainability index (2.42), which can be easily understood by analyzing the results of the indicators that achieved the lowest performances. Therefore, in order to solve this issue priority public policies should be applied, such as those that focus on investments in basic sanitation infrastructure, especially with regard to the collection and disposal of solid waste and drinking water supply, as well as infrastructure for energy supply in residences.

It is important to mention that the lack of infrastructure can result in serious environmental risks for the community and aggravate the negative impacts of tourism, since the arrival of visitors would naturally lead to an increase in the consumption of water, energy and the production of waste and tailings, adding further pressure on local resources. Thereby, such investments are essential to make the activity feasible, aiming at increasing the offer of services and tourist products and, at the same time, guaranteeing the basic

conditions of ordering the community in favor of local well-being.

In accordance with the index of each dimension, the community of Mem de Sá Island reached a medium level of environmental sustainability (2.79) as can be seen in Table 6.

Table 6 – Level of environmental sustainability of Mem de Sá Island, 2014.

Dimension	Index
Social	3,28
Economic	2,67
Natural	2,42
Level of environmental sustainability	**2,79**

Source: Own source, 2014.

As can be noticed, the dimension that most contributed negatively to this result was the natural dimension, which had the lowest index (2.42). Furthermore, the other dimensions are at a medium level, indicating that there are local weaknesses that need to be addressed in order to improve the results obtained by the dimensions and, consequently, enhance the level of environmental sustainability of the community. Therefore, the indicators are capable to objectively guide which priority public policies in this area of study.

Finally, the definitions of such public policies are associated with what Tainter (2006) says about the fact that sustainability emerges from a process of successful problem solving and is not related only to environmental conditions. It is noteworthy, above all, that sustainability is complex and can be achieved in different ways (Max-Neef, Elizalde and Hopenhayn, 2010), in other words, through the definition of different public policies to solve the problems pointed out by the indicators. As a result, it is necessary to systematically analyze the interaction among the dimensions and among the variables of the dimensions of environmental sustainability, in order to understand the current relationships and their synergistic effects.

Final considerations

In summary, it was found that the community of Mem de Sá Island has a medium level of environmental sustainability. Therefore, there are weaknesses that directly affect the quality of life of residents and the conservation of local natural resources. It is noticed that the community depends on improvements in their living conditions and investments in basic infrastructure to avoid the occurrence of negative environmental impacts and to guarantee the well-being of its residents.

Supplementarily, the weaknesses identified may imply in CBT, whose development has been stimulated in recent years in the community because it is a model that expands work opportunities and income complement; it also encourages empowerment and community organization, and values local natural and cultural resources. Thus, it has a

strong relationship with the idea of environmental sustainability.

During the exposition of the final results to the studied community, it was pointed out the CBT presents itself as a tourism management model that can rescue *sui generis* aspects of the local identity, especially with regards to artisanal fishing, which is traditionally practiced by many of the local residents. In turn, associativism and cooperativism, which are ways of translating community organization, can foster solutions to the socio-environmental problems they face today, while strengthening local leadership and solidarity.

In terms of sustainability assessment, it was found not only the relevance of the individualized analysis of each indicator, in order to objectify the real local demands, but also the systemic analysis of them, which allows to understand the synergistic effect of one indicator over the others, as well as over the dimension and the environmental sustainability. Systemic analysis leads to an understanding of how reality is complex and how much the interaction among its components affects the whole. In the meantime, the analysis of each indicator reveals the specific problems of the community and allows, based on the score reached, to prioritize actions aimed at environmental sustainability, according to the principle of equifinity of open systems.

As a result, the study depicted the importance of small-scale sustainability assessment models, which can be effective tools for monitoring the development process, especially in cases where there is a new productive activity underway that has the potential to cause negative environmental impacts unknown to the community. In this view, by assisting the decision-making processes, it acts as a planning and management mechanisms and can stimulate interest in community involvement and participation, principles supported by the CBT philosophy.

Therefore, this study is not limited to contributing only to the field of scientific knowledge, but also to its practical application since the results exhibited in this investigation may subsidize public policies through guidance decision-making in different instances of governance. However, the assessment should keep going so that the community gets closer to a desired ideal of environmental sustainability. Besides that, improvement actions must be implemented, and monitoring must take place periodically, which will generate more subsidies for the community to continue presenting its needs, reveal its priority areas for intervention and charge for actions that suit your interests.

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