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DEFINITION OF PRIORITY RECOVERY MEASURES THROUGH THE CONCEPT OF ECOSYSTEM SERVICES: THE CASE OF THE RIO SEIXO DE PEDRA ESTUARY (SANTIAGO DE IGUAPE)

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Abstract

The present work aims to identify the modification of social welfare of a traditional community derive from the degradation process of the adjacent river, through the study of the link between degradation and the ecosystem services offered to the population. Still, the work focuses on the definition of priority measures of recovery of water resources and riparian areas, in order to maximize the benefits to the community. The research was applied to the community of Santiago do Iguape (municipality of Cachoeira) and considered the riverine areas of the lower Seixo de Pedra River, where lives most of the population of this community. Through the implementation of the concept of ecosystem services, it was possible to recognize the real and more urgent demands of the Santiago community, in term of loss of provision, regulation and cultural services, caused by the present state of degradation f lower Seixo de Pedra River.

***Keywords**: Ecosystem Services, Seixo de Pedra River, Traditional Communities, Santiago do Iguape*

Introduction

The urban agglomeration brought and continues bringing various problems to the freshwaters. Although such problems are not restricted only to water resources, this resource represents a strong element of attraction that lead people to install their houses and activities nearby water sources, and, therefore, contributing to freshwaters degradation due to overexploitation and pollution from industries and domestic uses, among others (RODRIGUES and MALAFAIA, 2009). Hence, it comes the need to explore ways for combining the technological development with the preservation of natural resources.

With the growing concern with the nature preservation of the 20th century, it has emerged the concept of ecosystem services, as an important tool of analyses, aiming at identifying the numerous benefits provided directly or indirectly by nature to the human being, so that he can understand and value the importance of the natural environment for the social life and find ways to preserve it (ANDRADE and ROMEIRO, 2009).

The differential of this concept is the importance that is given to the opinion of the community agents that suffer from the negative effects of degradation. The identification of ecosystem services offered by an environment goes through the perception of externalities, both positive and negative, of that part of

population that makes use of its natural resources; hence the importance of picking up a closer relation between the researcher and the community. The identification of these services allows a more effective and efficient restoration project, since it points more specifically the problems faced by the affected community.

Areas with high water potential tend to be more explored due to its natural richness, and this is what happened also with the community of Santiago do Iguape, a predominantly fishing community with several rivers and streams that flow into the Bay of Iguape, a very rich natural ecosystem that provide most of natural resources used by the local population. However, the Seixo de Pedra River has a greater relevance to the community of Santiago, because before flowing into the Iguape Bay, it goes through the entire territory of the village, passing also by several homes backyards. The river has good water potential, and for this reason was chosen by EMBASA, the company responsible for water and sewer services of Bahia, as a source for local water supply.

However, the Seixo de Pedra River has been suffering over the years with an intense process of environmental degradation, especially in the segment that crosses the village of Santiago de Iguape. Due to these factors, it is possible to observe a loss of quality of life of the community, since a large portion of its economic, social and cultural activities is based on the resources offered by nature.

For this reason, this work aims to identify what are the factors of degradation worrying the lower Seixo de Pedra River, relating such a degradation to the ecosystem services provided to the population. Still, the research proposes to identify priority measures of water resource and riparian areas restoration, in accordance with the urgencies of local people.

Main Objective

This work will characterize the environmental problems occurring in the District of Santiago do Iguape, more precisely at the mouth of the Seixo de Pedra River, having as main objective to propose recovery actions, in accordance with the priorities of local people, in order to restore at least part of the ecosystem services that the community of Santiago de Iguape used to enjoy.

Methodology

The comprehension of the dynamic behavior of ecosystems in terms of supply of natural resources is better achieved through the knowledge of the ecosystemic functions, consisting in the existing interactions between the structural elements of an ecosystem, including transfer of energy, nutrient cycling, climate regulation, and water cycle (ANDRADE and ROMEIRO, apud 2009. Daly; Farley, 2004). The understanding of this concept is essential to identify how benefits, direct or indirect, are provided by nature to human society, since from this concept derives another, called ecosystem services. The essential idea lies in the possibility that a given ecosystem function can provide benefits that can be used for human interest, namely, certain ecosystem functions may become an ecosystem service depending on their possibility of being benefited by humans.

The present work analyzes the types of degradation that affect the Seixo de Pedra River through the concept of ecosystem services, which allows to use the environmental knowledge of traditional communities, in addition to the scientific technical understanding, in order to better understand the functioning of ecosystems and, thus, develop more appropriate recovery actions. The term ecosystem services imply the fact that a particular natural feature is available and benefits a community, thus, who better than local agents could judge which losses are the most relevant, and what kinds of degradation affect them most?

This work was adopted the classification of ecosystem services proposed by the Millennium Ecosystem Assessment – MEA (2005), promoted by the United Nations in order to show, through scientific insights, that environment changes, driven by anthropic actions, would have a real impact on

population quality of life, due to the loss in the ecosystem services provided by nature (ROSA 2014, apud. HASSAN et al. 2005).

The Participatory Rapid Appraisal (PRA) technic (Freitas et al. 2012) was used, which seeks to take into consideration the cultural values of a community, through the voluntary manifestation of the most relevant social actors in relations to the problem raised in the study area. The technic is called "participatory" because it engages the population directly involved with the issue, along with the experts realizing the diagnosis, in order to collect the necessary information to evaluate the target problem. It is called "rapid" because it seeks to gather and systematize the information in a short time, through meetings with actors, which is a favorable benefit when there is no resources to finance a longer survey (Freitas, Days, & Freitas, 2012).

For the application of this methodology, were respected the 7 steps proposed by Verdejo (2006):

- Step 1: set the objective of the appraisal: preliminary visits were made in order to guide and adjust the definition of specific objectives.
- Step 2: Select and prepare the mediator team. The mediating team was prepared before the field practice.
- Step 3: Identify potential participants: it was encouraged the involvement of people representing the various social groups in the community, young and old, men and women, those who work in the center, people with and without schooling, disabled, etc. It is important to have a complete diagnosis of the problems faced.
- Step 4: Identify the expectations of PRA participants: the expectations of participants were analysed and explained the purpose of the participatory dynamics, making clear that it represents a tool of diagnosis of community problems.
- Step 5: Discuss information needs: through dialogue between the mediating team and members of the community were identified the specific information necessary for the preparation of a recovery project, always seeking the best way to benefit of the community.
- Step 6: Select the search tools: the specific techniques of PRA were chosen with the community, respecting the differences among the participants, since each, with their perceptions on different issues, can choose different tools of analysis.
- Step 7: Draw the Diagnostic process: before the PRD, were defined the people who composed the team of PRA; beginning and ending period of diagnosis; where the research was carried out; materials used by participants of research to document the results.

Once acquired the necessary information about the most important social demands, and with groups of social actors already defined, a questionnaire was applied, trough a semi-structured interview framework. The questionnaire focused on the study of ecosystem services provided by the river today, compared with those offered in the past.

After obtaining the information provided by the respondents, a prioritization process of ecosystem services was performed, in descending order of importance according to the community opinion. This led to the identification of the five most important Ecosystem Services for the community.

Parallel to the participatory process, the authors developed a theoretical framework that correlates ecosystem services, the possible causes of degradation and the impacts derived to services modification. For each service and type of degradation were associated recovery actions and techniques, commonly diffused in the scientific world, which could recover the ecosystem service. This framework created the base for linking the identified priority ecosystem services to the most effective actions for recovering the river, in attendance to local community's needs and expectations.

Results

From the development of this work it was possible to involve the community of Santiago do Iguape in identification of the main ecosystem services affected by the degradation of the Seixo de Pedra River, whose negative effects on the traditional activities are daily experienced by the population.

It was possible to prioritize the five most important ecosystem services and relate them to possible degradation causes that can lead to their interruption, always taking into account the opinions, feelings and perceptions of fishermen, shellfish and residents inhabitants.

After the identification of the main problems faced by the community, with respect to the degradation of the Seixo de Pedra River, some technical recovery measures were proposed in order to mitigate the process of river degradation, and bring back at least part of the ecosystem services once enjoyed by the community of Santiago do Iguape.

Discussion and Conclusions

The present study shows that the use of the concept of ecosystem services is an effective and flexible instrument that can improve the definition of recovery proposals for degraded areas. The proposed methodology allowed a better understanding of the environmental correlations and thus developing more appropriate recovery actions to attend the real needs of local populations.

In addition, the study shows that the involvement of the key local actors affected by the problem makes the result more effective, but also makes the involved people more aware of the importance of preserving the environment by the members of the community.

The use of Ecosystem Services concept resulted to be a very effective tool in the identification of welfare losses of the community, through their own perceptions, which has facilitated the achievement of the study objectives.

Studies about the environment and its preservation should be encouraged, considering that the actual trend of acceleration of technological growth and human population lead to the increasing exploitation of the natural resources. The best way to protect nature without sacrificing development is to valorize traditional knowledge, foster environmental education and study the linkage between environmental functioning and human direct and indirect benefits.

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