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BUILDING CONNECTIONS FOR GLOBAL GEOCONSERVATION

Editors: G. Lozano, J. Luengo, A. Cabrera and J. Vegas

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ABSTRACT BOOK

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Editors

Gonzalo Lozano, Javier Luengo, Ana Cabrera and Juana Vegas

Instituto Geológico y Minero de España

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Geodiversity index maps and watersheds as tools to select priority areas: example of the coast of São Paulo, Brazil

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Introduction

Ecosystem services (ES) are the goods and services that nature provides for society. According to Gray (2013), ES provided by geodiversity are divided into five functions: regulating, supporting, provisioning, cultural and knowledge. As this approach to geodiversity is relatively recent, there is no established method of delimiting areas for assessing ES. In this sense, geodiversity index maps can be used as a tool. This cartographic method is interesting because it allows quantitative evaluation of geodiversity by means of a special analysis of the distribution and frequency of the abiotic elements. This research aims to present the process of selection of a pilot area for the evaluation of ecosystem services of geodiversity in the Baixada Santista, central coast of the state of São Paulo, Brazil. The region is marked by Precambrian terranes organised in a NE-SW structural trend due to important shear zones that controlled the geometry of the coastline. Escarpments and lowlands formed in the Cenozoic due to vertical movements and in the Quaternary due to transgressive and regressive movements. Due to the hot and humid climate, Baixada Santista has a dense drainage system subdivided into 21 hydrographic basins that have their own management.

Methodological Procedures

The following steps were used:

1) Preparation of the geodiversity index map of Baixada Santista region. We used the method proposed by Pereira et al. (2013), which is based on a composition of maps of the physical environment integrated into a grid of polygons. Each map generates an intermediate index, which sum results in the geodiversity index. These sub-indices were elaborated from the following maps: geology and mineral resources - Perrotta et al. (2005); geomorphology - Perrotta et al. (2005) and Ross and Moroz (1996); pedology - Oliveira et al. (1999). The values obtained were organized into five classes that represent the geodiversity index: very low, low, medium, high, and very high.

2) Elaboration of the hydrographic basin map. The watershed map was prepared based on Perrotta et al. (2005) and within the limits provided by the Baixada Santista Watershed Committee.

3) Delimitation of the selected area. In this step, the geodiversity index map and the watershed map were superimposed to select the pilot area.

Results

The geodiversity index map was obtained by integrating the sub-indices geology, geomorphology, pedology, and mineral resources. This map shows the high indices of geodiversity are concentrated in the northern and western portion of the Baixada Santista, however, in the upper central part of the map (along the NE-SW direction), there are areas of very high geodiversity. Due to the hot and humid local climate, the watershed map has a dense drainage network divided into 21 basins. When overlapped, the geodiversity index and watershed maps indicated the SW region of the Jurubatuba watershed as the one with the highest index. Therefore, this area was selected to test both qualitative and quantitative methods for the assessment of ecosystem services provided by geodiversity (Fig. 1).

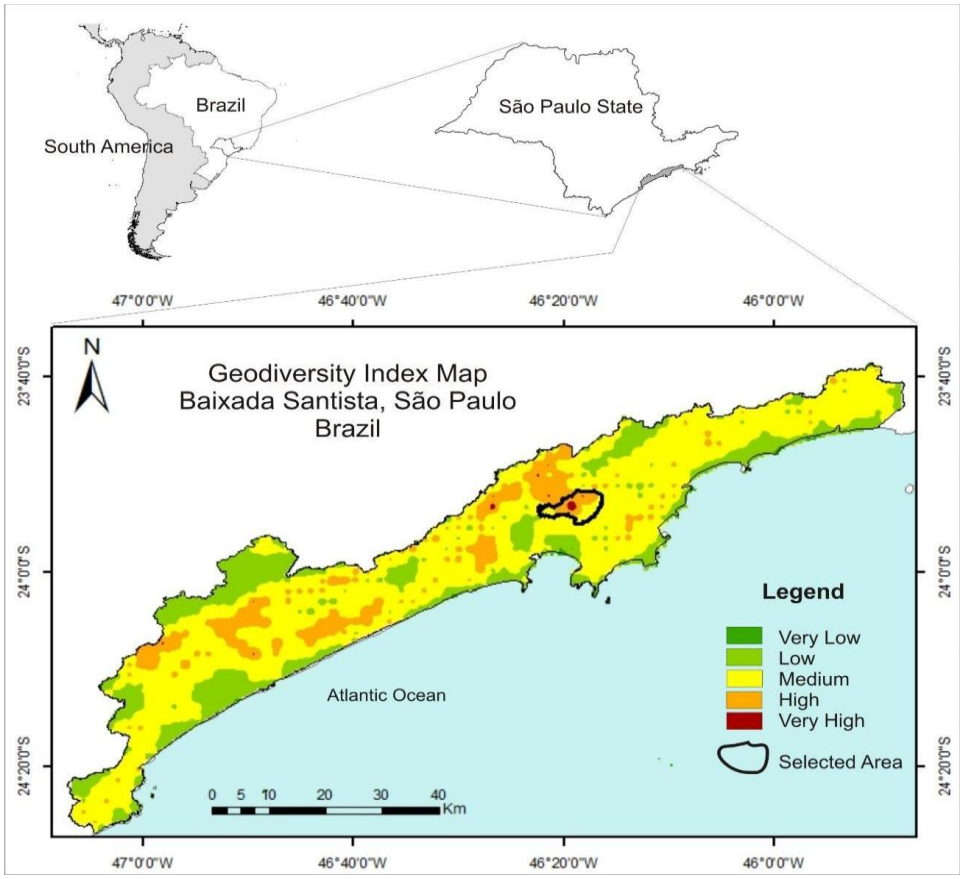

Fig. 1. Location map of the study area with the geodiversity index map and the selected area.

Discussions and Conclusions

The development of specific methods for assessing ES provided by geodiversity depends on the adequate knowledge and degree of cartographic detailment of the area. In large areas, such as the Baixada Santista, this assessment can be challenging due to heterogeneities and the difficulty of delimiting physical parameters, such as lithology, geological structures and hidrology. Thus, the selection of priority areas may be an interesting approach because it can assist in directing actions. In this sense, the geodiversity index map of Baixada Santista showed to be an important tool to help this selection, as it can be done remotely before fieldwork and highlight areas with high concentration of abiotic elements. The choice of a land management criterion, such as the watershed, is beneficial for the assessment of ecosystem services as it facilitates communication with stakeholders. In addition, in the area of the watershed, different land uses may occur, which may indicate different uses of ES. Therefore, overlapping areas of high geodiversity index with river basins has shown to be an effective tool in the selection of priority areas that can be used in the assessment and conservation of ecosystem services provided by geodiversity.

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