

10th International ProGEO Symposium

Abstract Book

BUILDING CONNECTIONS FOR GLOBAL GEOCONSERVATION

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



10th International ProGEO online Symposium

ABSTRACT BOOK

**BUILDING CONNECTIONS FOR
GLOBAL GEOCONSERVATION**

Editors

Gonzalo Lozano, Javier Luengo, Ana Cabrera and Juana Vegas

Instituto Geológico y Minero de España

2021

Building connections for global geoconservation. X International ProGEO Symposium
Ministerio de Ciencia e Innovación
Instituto Geológico y Minero de España
2021
Lengua/s: Inglés
NIPO: 836-21-003-8
ISBN: 978-84-9138-112-9
Gratuita / Unitaria / En línea / pdf

© INSTITUTO GEOLÓGICO Y MINERO DE ESPAÑA

Ríos Rosas, 23. 28003 MADRID (SPAIN)

ISBN: 978-84-9138-112-9

10th International ProGEO Online Symposium. June, 2021. Abstracts Book.

Editors: Gonzalo Lozano, Javier Luengo, Ana Cabrera and Juana Vegas

Symposium Logo design: María José Torres

Cover Photo: Granitic Tor. Geosite: Ortigosa del Monte's nubbin (Segovia, Spain). Author: Gonzalo Lozano.

Cover Design: Javier Luengo and Gonzalo Lozano

Layout and typesetting: Ana Cabrera

10th International ProGEO Online Symposium

2021

Organizing Committee, Instituto Geológico y Minero de España:

Juana Vegas
Enrique Díaz-Martínez
Ana Cabrera
Luis Carcavilla

Andrés Díez-Herrero
Gonzalo Lozano
Javier Luengo
Ángel Salazar Rincón

Scientific Committee:

Daniel Ballesteros
Eduardo Barrón
José Brilha
Margaret Brocx
Viola Bruschi
Carles Canet
Thais Canesin
Tom Casadevall
Graciela Delvene
Lars Erikstad
Esperanza Fernández

Inés Galindo
Ewa Glowniak
Marcela Gómez
Maria Helena Henriques
Asier Hilario
Gergely Horváth
Tapio Kananoja
Jerónimo López-Martínez
Ljerka Marjanac
Álvaro Márquez
Esther Martín-González

Silvia Menéndez
Fernando Miranda
Manu Monge Ganuzas
Kevin Page
Paulo Pereira
Isabel Rábano
Joao Rocha
Ana Rodrigo
Jonas Satkūnas
Martina Stupar
Marina Vdovets

Cultural ecosystem services of geodiversity and awareness-raising on geoconservation: a perspective from the Ceará Central Domain, North-eastern Brazil

Pâmella Moura^{1,2} & Maria da Glória Motta Garcia^{1,2}

¹Federal University of Ceará, Centre of Sciences. Geology Graduate Program. Campus do Pici, Block 912. CEP 60440-554, Fortaleza, Ceará, Brazil. e-mail: pamella_mm@yahoo.com.br.

²Centre for Research Support on Geological Heritage and Geotourism, Institute of Geosciences, University of São Paulo, Rua do Lago, 562, CEP 05508-080, São Paulo, SP, Brazil. e-mail: mgmgarcia@usp.br.

Keywords: Ceará. Geoheritage. Goods and Benefits. Nature Conservation.

Introduction

Cultural ecosystem services provided by geodiversity comprehend the goods and benefits non-tangibles from abiotic nature that contribute to the development of the human culture, such as science, education, leisure, religion, arts etc. (Millennium Ecosystem Assessment, 2005; Brilha et al. 2018). Considering that population are prone to protect rather their cultural heritage than the natural heritage (Reynard and Giusti 2018), this work aims a preliminary analysis of cultural ecosystem services provided by geodiversity in the Ceará Central Domain (CCD), north-eastern Brazil, in order to contribute to its conservation and sustainable use. The CCD is one of the oldest tectonic terranes in Brazil, being composed of a mixed assemblage of Precambrian igneous and metamorphic rocks, especially gneisses, tonalites, granodiorites, mafic/ultramafic rocks, schists, and granites. The area is also characterized by a rocky, flat, and semiarid landscape with scattered inselbergs and residual massifs, besides stony soils, and a sparse and irregular rainfall, where the Caatinga Biome predominates.

Methods and Main Results

An extensive review of the literature was carried out focusing on: i) the geodiversity of the study area, ii) the local geological heritage, through inventories of geosites and geodiversity sites, already available, iii) the historical-cultural heritage sites, iv) the artistic production, and v) the tourism supply. Based on this information, an overview was delineated with the main aspects of geodiversity and culture in the region, being possible to identify the relationships between such elements. From this overview, the cultural ecosystem services were analysed using the four categories suggested by Brilha *et al.* (2018): wellness and health, recreation, human history, and knowledge. As a result, nine cultural goods and benefits provided by geodiversity were identified in the working area (Table 1).

Discussion and Conclusions

A strong connection between geodiversity and local culture was observed in the area, expressed through cultural ecosystem services. The variety of landscapes and their easy access result in positive impacts on human well-being provided by contact with nature, especially during leisure activities. The influence of geodiversity on cultural production is also notable: many Brazilian movies use this peculiar landscape as filming location. We also found examples from literature, such as novels and “*cordel*” booklets, a popular regional literature in North-eastern Brazil. Regarding recreation activities, the rocky landscape is regionally recognized as an important tourist attraction, mostly the inselbergs and residual massifs. These landforms offer a great number of viewpoints and are used for sports activities, such as hiking, rock climbing and air sports. In recent years, the academic community has discussed the region’s potential for geotourism more intensively and the Geological Survey of Brazil is developing a geopark project for the central region of the CCD. Concerning Human history, the features related to local geodiversity strongly influences toponymy and sense of place throughout the study area. In our research, we found many places named after geological qualities, such as *Pedra Branca* town (White Stone) and *Pedra de Cal* village (Limestone), and also places with spiritual meanings, particularly some inselbergs and caves, commonly associated with archaeological records. It is also worth to note the use of local stones in historic monuments and contemporary buildings, highlighting the use of granites and mylonitic

gneisses. Respecting scientific research, local geodiversity offers material to the development of several branches in geosciences, notably in regional geology, petrology, structural geology, mineral resources, and geomorphology. The main cultural services associated with geoheritage and historical evolution of the Earth is related to the Precambrian West Gondwana orogenesis, including important features of the geological evolution of the South American Continent. Many of the geoheritage sites available in the CCD are used in the field classes for local universities, mainly for geoscience's students. An analysis of the undergraduate geology course curriculum from a local university identified 12 disciplines that make use of geoheritage sites as didactic examples. Since population is more sensitive and familiar with cultural aspects, the cultural ecosystem services provided by the geodiversity should enhance the geoconservation strategies in the CCD.

Table 1. Preliminary identification of cultural goods and benefits provided by the geodiversity in the working area

Cultural Goods and Benefits			
Wellness and health	Recreation	Human History	Knowledge
Physical and mental health promoted by contact with natural landscapes	Recreation and sport activities (hiking, trails, cycling, rock climbing, air sports)	Sense of place, symbols, toponymies and spiritual values, mainly religious meanings	Scientific research in several branches of geosciences
Inspiration for cultural production (books, paintings, movies, legends etc.)	Tourist attractions (water reservoirs, viewpoints, mountains)	Use of local stones in historical monuments	Sites of geoheritage and historical evolution of the Earth
			Educational value as field resources for geoscience students

Acknowledgments

The authors are thankful to reviewer for his helpful comments. This study was funded by the CAPES (Brazil) - grant n. 306365/2013-01/PNPD.

References

- Brilha J, Gray M, Pereira DI, Pereira P (2018) Geodiversity: An integrative review as a contribution to the sustainable management of the whole of nature. *Environmental Science and Policy* 86:19–28
- Millennium Ecosystem Assessment (2005) *Ecosystems and Human Well-being: Synthesis*. Island Press, Washington, DC, 137 p.
- Reynard E, Giusti C (2018) The Landscape and the cultural value of geoheritage. In: Reynard E, Brilha J. (eds.) *Geoheritage: assessment, protection, and management*. Elsevier, Amsterdam, pp: 147-166.