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Towards the 2030 Agenda**

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A block scree of Cambrian quartzitic sandstones on the slope of the Łysa Góra Range – relict of frost weathering during the Pleistocene. Photograph by Peter Pervesler

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Enhancing geoconservation strategies by quantitative assessment of geosites in the Ceará Central Domain, Northeastern Brazil

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In general, the rural area of Northeast of Brazil is characterised by low socioeconomic conditions, partially due to a harsh semiarid climate, as it is the case of the Ceará state. The main geological setting of this state is dominated by the Ceará Central Domain (CCD), one of the oldest tectonic ‘terrane’ in Brazil. It is composed of a mixed assemblage of magmatic and metamorphic rocks, mainly formed due to compression efforts in the West Gondwana continent during the Neoproterozoic. This domain also includes important features representing the geological evolution of the South American Continent. Taking into account the success of several geoconservation

initiatives implemented around the world in the last two decades, an inventory of geoheritage has been developed in this domain, seeking to identify geological sites (geosites and geodiversity sites) that could be used to promote local sustainable development. The working area of about 39.000 km² comprises 29 municipalities (Fig. 1). To date, 52 geological sites were identified, representing eight geological frameworks (Moura *et al.* 2017). A quantitative assessment of these geological sites was calculated aiming to reduce the subjectivity of the inventory process and to provide information to allow a proper site management, as stated in Brilha (2016).

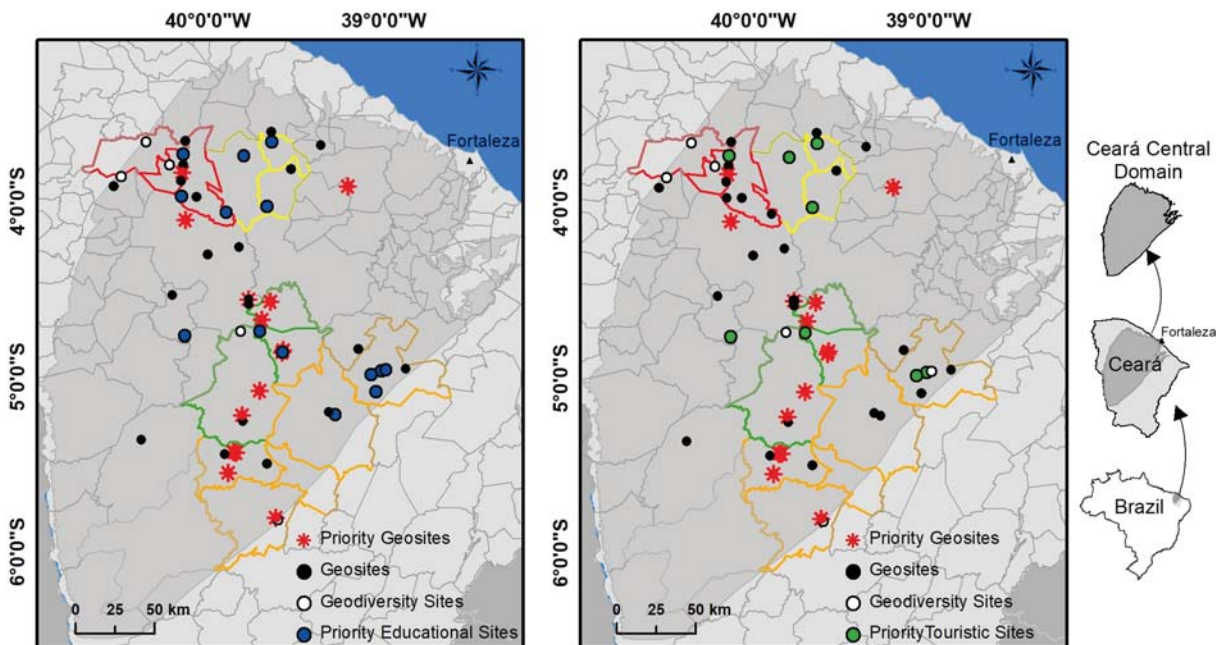


Fig. 1. Priority areas for a geoconservation management plan in the Ceará Central Domain, highlighting geosites, geodiversity sites and priority sites for educational and touristic purposes.

The Geological Survey of Brazil (CPRM) has developed an online platform named GEOSSIT in order to guide and standardize the inventory and quantitative assessment of national geoheritage (Lima *et al.* 2012; Rocha *et al.* 2016). GEOSSIT was adapted from Brilha (2005, 2016) and Garcia-Cortés, Carcavilla (2009) proposals by considering the local conditions in Brazil. Based on the data uploaded by each researcher, the platform calculates the scientific value, the degradation risk, the potential educational and touristic uses, besides the scientific, educational and touristic protection priorities. The protection priorities assessment aims to identify which geosites should receive the first actions and resources for conservation, regarding their values, potential uses and degradation risk (Garcia-Cortés, Carcavilla 2009). In this work, it was necessary to ensure that both geosites with high scientific value and relevant potential uses would be included in a future geoconservation management plan; therefore, different priorities were assessed considering each value and use.

According to the GEOSSIT platform, 44 sites were considered as geosites, scoring more than 200 points for scientific value, whereas 8 sites were considered as geodiversity sites, scoring less than 200 points. Degradation risk was moderate for 60% of sites. Educational and touristic uses scored ranging 165 to 335 points and 150 to 320 points, respectively, from a total of 400 points. Only geological sites scoring more than 250 points for educational or touristic uses and more than 200 points for scientific value were considered for the next stages of the work. As a result, three sorted lists of geological sites were obtained: (1) Scientific protection priority with 14 geosites; (2) Educational protection priority with 14 geosites and (3) Touristic pro-

tection priority with 8 geosites. Four priority areas could be defined based on the distribution of sites inside the CCD and the administrative units of regional planning, according to the Ceará Decree-Law nº 154/2015 (Fig. 1).

The quantitative assessment of geoheritage in the CCD allowed defining the priority sites for protection of scientific value as well as the promotion of potential uses. One of these presented areas will be chosen to develop a geoconservation management plan based on geoeducational and geotourism purposes.

References

- Brilha, J. 2005. Património Geológico e Geoconservação: A conservação da natureza na sua vertente geológica, pp. 1190. Palimage Editores; Braga.
- Brilha, J. 2016. Inventory and Quantitative assessment of geosites and geodiversity sites: a review. *Geoheritage*, 8 (2), 119–134.
- García-Cortés, A., Carcavilla, L.U. 2009. Documento metodológico para la elaboración del Inventario Español de lugares de interés geológico (IELIG), 2, pp. 1–164. Instituto Geológico y Minero de España; Madrid.
- Lima, E.R., Rocha, A.J.D., Schobbenhaus, C. 2012. GEOSSIT: Uma ferramenta para o Inventário de geossítios. 46 Congresso Brasileiro de Geologia, Santos, Brazil, September 30 – October 5, 2012, p. 35. Sociedade Brasileira de Geologia; São Paulo.
- Moura, P., Garcia, M.G.M., Brilha, J. 2017. Conservation of geosites as a tool to protect geoheritage: the inventory of Ceará Central Domain, Borborema Province – NE Brazil. *Annals of the Brazilian Academy of Sciences*, 89 (4), 2525–2645.
- Rocha, A.J.D., Lima, E., Schobbenhaus, C. 2016. Aplicativo GEOSSIT: nova versão, 48º Congresso Brasileiro de Geologia, Porto Alegre, Brazil, 9–13 October, 2016, p. 6389. Sociedade Brasileira de Geologia; São Paulo.