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Assessment of the geoheritage of the municipality of Carnaúba dos Dantas, NE Brazil, with a view to its geotourism development

Avaliação do Geopatrimônio do município de Carnaúba dos Dantas, NE do Brasil, com vista ao seu aproveitamento geoturístico

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Abstract: The assessment of geoheritage is a relevant topic for highlighting abiotic heritage, and several methods have been proposed to analyze and assess geodiversity with qualitative and quantitative objectives, either broadly or narrowly. Some works developed in these approaches can be seen in the studies by Brilha (2005), Reynard (2006), Pereira (2006), Reynard et al. (2007), Pereira (2010), Brilha (2012), Reynard et al. (2016), among others. From this perspective, this manuscript proposes an assessment of the geoheritage of Carnaúba dos Dantas, a municipality located in the interior of the state of Rio Grande do Norte, respectively, in the intermediate region of Caicó. For the selection and inventory of new geosites, the method developed by Araújo et al. (2024) was used, subsequently employing the proposal by Diniz, Araújo, and Chagas (2022) in the quantitative method, which takes into account scientific, aesthetic, and tourist values. Six sites of geopatrimonial interest were evaluated, five of which stood out as geosites in terms of scientific and aesthetic values, showing representative geomorphological processes and aspects, a variety of geodiversity elements, and good visual quality. Consequently, this method shows a significant response in highlighting the potential of a site.

Keywords: Geoheritage; geoconservation; geotourism; Carnaúba dos Dantas.

Resumo: A avaliação do geopatrimônio é um tema relevante para destacar a herança abiótica, e, diversos métodos foram propostos para analisar e avaliar a geodiversidade com objetivo qualitativo e quantitativo, seja de forma ampla ou restrita. Alguns trabalhos desenvolvidos nestas abordagens são vistos nos estudos de Brilha (2005), Reynard (2006), Pereira (2006), Reynard *et al.* (2007), Pereira (2010), Brilha (2012), Reynard *et al*. (2016), entre outros. Nessa perspectiva, este manuscrito propõe uma avaliação do geopatrimônio de Carnaúba dos Dantas, município localizado no interior do estado do Rio Grande do Norte, respectivamente, na região intermediária de Caicó. Para a seleção e inventariação de novos geossítios, foi utilizado o método desenvolvido por Araújo et al. (2024), posteriormente empregou a proposta de Diniz, Araújo e Chagas (2022), no método quantitativo, que levam em consideração os valores científicos, estéticos e turísticos. Foram avaliados seis locais de interesse do geopatrimônio, cinco se destacaram como geossítios, nos critérios de valores científicos e estéticos, mostrando representativa dos processos e aspectos geomorfológicos, variedade de elementos da geodiversidade e uma boa qualidade visual. Consequentemente, este método mostra uma resposta significativa ao destacar o potencial de um local.

Palavras-chave: Geopatrimônio; geoconservação; geoturismo; Carnaúba dos Dantas.

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1. Introduction

Geodiversity is understood as natural diversity corresponding to geological, geomorphological, pedological, hydrological, and climatic elements (GRAY, 2013; CLAUDINO-SALES, 2021). This theme is related to the physical basis on which life, cultures, and landscapes develop. Studies that highlight this approach have brought important innovations for counting and valuing abiotic elements.

Through the vast geodiversity that exists across the planet, the concept of geoheritage has emerged, which deals with a significant portion of abiotic elements. For Borba and Sell (2018), this is formed "by materials, features, processes, or relationships left as a legacy or memory by the evolution of the abiotic processes of planet Earth to humanity and, in particular, to the communities in whose territory of life such elements occur."

In this context, geoconservation emerges to recognize and establish measures aimed at its protection and dissemination. According to Sharples (1995), geoconservation is treated as the conservation of the planet's abiotic diversity. According to Brilha (2005), there are several stages in the geoconservation process, such as inventory, quantification, classification, conservation, valuation, dissemination, and finally, monitoring. The inventory and quantification stages are the first two processes in this approach and characterize and quantify the added value inherent to a location (DINIZ; ARAÚJO; CHAGAS, 2022).

Given this, geotourism presents itself as a strategic measure to strengthen geoconservation and enhance geoheritage Thus, according to Silva et al. (2021), geotourism refers to "an activity that aims at visiting and interpreting sites with geological and related resources that, added to the social, cultural, and historical aspects of the destinations, constitute tourist attractions."

Geotourism becomes even more relevant when it comes to territories recognized as geoparks, which are defined by UNESCO (2025) as "unique and unified geographical areas where sites and landscapes of international geological importance are managed with a holistic concept of protection, education, and sustainable development."

In certain areas of northeastern Brazil, such as the municipality of Carnaúba dos Dantas, Rio Grande do Norte, there are geosites that are valued and are part of the UNESCO Seridó Global Geopark, but which are often seen as indestructible, as if they could not be degraded. These structures constitute important macro and microforms to be analyzed and disseminated to society.

Given this, there is a need to explore sites of geopatrimonial interest in the municipality of Carnaúba dos Dantas, Rio Grande do Norte (RN), which were not incorporated into the delimitation of the UNESCO Seridó Global Geopark, with the aim of identifying, characterizing, and quantifying these sites so that they can be incorporated into the territory in the future due to their great relevance. This study aims to evaluate the geoheritage of the municipality of Carnaúba dos Dantas/RN, also considering its geotourism potential.

2. Study Area

The municipality of Carnaúba dos Dantas/RN, with an area of 245 km² (CPRM, 2005), is located in the Pegmatitic Province of Borborema (PPB), NE Brazil, in the eastern portion of the Rio Piranhas-Seridó Domain (DRSP). Geologically, the municipality consists of a gneissic-metavolcanic-sedimentary basement dating from the Neoproterozoic (CABRAL NETO *et al*., 2018). The latter sequence is part of the Seridó Group, consisting, from bottom to top, of the following lithostratigraphic units: Jucurutu Formation (paragneisses); Equador Formation (quartzites); and Seridó Formation (micaxists) (DANTAS; MEDEIROS; CAVALCANTE, 2021), both intruded by centimetric to metric pegmatite dikes (CABRAL NETO et al., 2018) and occasionally by basalt, associated with Macau volcanism (Figure 1).

The geomorphology of Carnaúba dos Dantas/RN is characterized by hilly and flattened erosive surfaces, which occur bordering residual reliefs, and by the fluvial plain of the Carnaúba River (middle course). This evolution took place under a regime of tectonic stresses conditioned by rupture deformation planes, but above all by the Totoró, Umburana, and Frei Martinho shear zones. These ductile and rupture deformation planes guided Quaternary dissection and deposition, thus making the structural control of residual reliefs and valleys evident.

The climate is tropical equatorial, varying from 7 to 8 dry months (NÍMER, 1977; DINIZ; PEREIRA, 2015), with a hot and dry climate characterized by a short rainy season (CPRM, 2005). Its average annual rainfall varies between 460 and 670 mm, with a rainy season from February to April (EMPARN, 2010), influenced by the Intertropical Convergence Zone (ITCZ) (FERREIRA; MELLO, 2005), whose significance is associated with El Niño episodes, which favor reduced precipitation, and La Niña, which provides periods with positive precipitation anomalies (RODRIGUES et al., 2017). The average annual temperature is 27.5°C, with a maximum of 33°C and a minimum of 21°C, and 2,400 hours of sunshine per year (Lucena, 2016), which explains the high rates of evapotranspiration.

The predominant vegetation is hyperxerophytic deciduous shrubby caatinga, with variable size (e.g., Pereiro - *Aspidosderma pyrifolium*; Jurema preta - *Mimosa hostilis*; Catingueira - *Caesalpinia pyramidalis* Tul.), as well as cacti (e.g., *Melocactus zehntneri* - Coroa de Frade) and bromeliads (e.g., *Encholirium spectabile* - Macambira) (CPRM, 2005). The predominant soil type is Litholic Neosol, which has a thin and underdeveloped profile (CPRM, 2005).

3. Methodology

The methodology employed involved a literature review on geodiversity, geoheritage, geoconservation, geotourism, and geoparks, as well as fieldwork in the municipality of Carnaúba dos Dantas/RN, which enabled geomorphological analysis of the territory, application of qualitative and quantitative data sheets, and laboratory data analysis.

The fieldwork and reconnaissance aimed to identify and characterize macro and micro landforms. The identification and classification of these forms, mainly associated with the escarpments of metamorphic residual reliefs, followed the taxonomic criteria of Migón (2006).

The assessment method developed by Araújo et al. (2024), adapted from Tricart (1977); Souza (2000); Andrade (2003); Brilha (2005); Reynard (2006); Pereira (2010); ICMBio (2011); Gray (2013); Gray; Gordon; Brown (2013); Gordon; Barron (2013); Figueiró; Vieira; Cunha (2014); Gordon (2015); Brilha (2016); Reynard et al. (2016); Brazil (2018); Claudino-Sales (2018); Gordon (2018); Rabelo (2018); Claudino-Sales (2019).

In the quantitative assessment of geomorphological heritage, the method developed by Diniz, Araújo, and Chagas (2022) was used, adapted from Tricart (1977), Pereira (2006), Reynard (2006), Reynard et al. (2007), Pereira (2010), Reynard et al. (2016), and Brilha (2016), considering scientific, aesthetic, and tourist values. The score for each criterion ranges from 0 to 4, which when added together result in a very low, low, medium, or high score. To be considered a geosite, the location must obtain more than 75% of the evaluation in the central values, that is, high in scientific value and/or high in aesthetic value.

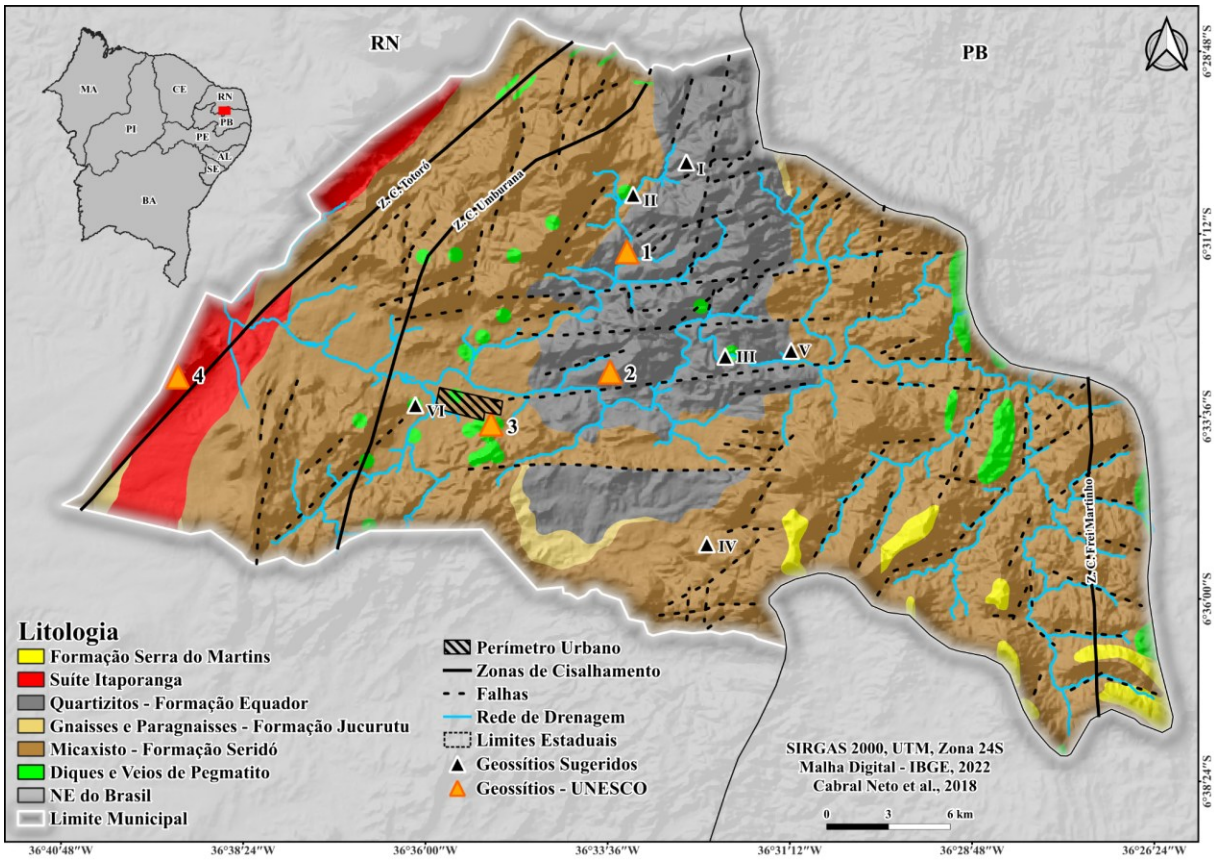
Geotechnology tools enabled the construction of a geospatial database with matrix and vector files. In this perspective, scene S07W037 from the Forest and buildings removed Copernicus DEM (FABDEM) V1-2 model was used, with a spatial resolution of ~30 m (NEAL; HAWKER, 2023). This scene was used to extract topographic attributes (altimetry and slope), which allowed for the analysis of morphological variations, which were analyzed together with lithostructural data.

The geological information from regional mapping used is available on the website of the Geological Service of Brazil (SGB/CPRM), having consulted the geological and lithium mineral resources map of the Borborema Pegmatite Province, on a scale of 1:250,000 (CABRAL NETO et al., 2018), and the geological map of the State of Rio Grande do Norte, at a scale of 1:500,000 (DANTAS; MEDEIROS; CAVALCANTE, 2021).

4. Results and Discussions

Six sites of geological/geomorphological interest were analyzed for this article: Pedra do Alexandre, Vulcanismo Volta do Rio, Talhado do Gavião, Casa Santa, Cachoeira do Chapéu, and Pedra do Dinheiro, in the municipality of Carnaúba dos Dantas/RN, given their representativeness and geotourism potential, since the municipality is part of the UNESCO Seridó Global Geopark. Figure 1 shows the location of the geosites already belonging to the Geopark and the six new sites of geomorphological interest, which may be integrated into the territory in the future.

Figure 1 - Map showing the location of geodiversity hotspots in the municipality of Carnaúba dos Dantas, NE Brazil.



Source: author (2025). Caption: (1) Fundões Waterfall; (2) Xique–Xique; (3) Monte do Galo; (4) Serra da Rajada; (I) Casa Santa; (II) Chapéu Waterfall; (III) Volta do Rio Volcanism; (IV) Talhado do Gavião (V) Pedra do Alexandre; (VI) Pedra do Dinheiro.

The goheritage assessment was carried out concurrently, with inventory and quantitative assessment together for each location in the municipality, exposing the main characteristics of the locations, such as negative cavities in escarpments, tafoni, basalt rock outcrops, castle koppies, and rock blocks, in addition to the beautiful landscapes that this geoheritage presents. Tables 1, 2, and 3 show the results of the quantitative assessment.

Table 1: Result obtained from the sum of the criteria considered for defining the Scientific Value of the new *hotspots* identified in Carnaúba dos Dantas/RN.

Locations	**Scientific Value**								
	A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**Total**	**Ranking**
Pedra do Alexandre	4	3	4	3	4	4	4	26	High
Vulcanismo Volta do Rio	0	4	4	2	4	4	3	21	Medium
Talhado do Gavião	4	3	4	4	4	4	3	26	High
Casa Santa	4	3	4	4	4	4	2	25	High
Cachoeira do Chapéu	0	3	4	4	4	4	2	21	Medium
Pedra do Dinheiro	3	3	3	2	3	3	4	21	Medium

Source: prepared by the authors (2025). Legend: A1: Degree of Scientific Knowledge; A2: Ecodynamics of the environment; A3: Representativeness of geomorphological materials and processes; A4: Diversity of geomorphological aspects (forms and processes); A5: Ecological Interest; A6: Paleogeographic Value; A7: Didactic Relevance.

Table 2: Result obtained from the sum of the criteria considered for defining the Aesthetic Value of the new *hotspots* identified in Carnaúba dos Dantas/RN.

Locations	**Aesthetic Value**						
	B1	**B2**	**B3**	**B4**	**B5**	**Total**	Ranking
Pedra do Alexandre	3	3	4	2	4	16	High
Vulcanismo Volta do Rio	3	4	4	3	4	18	High
Talhado do Gavião	3	4	4	4	4	19	High
Casa Santa	3	4	4	3	4	18	High
Cachoeira do Chapéu	3	4	4	3	4	18	High
Pedra do Dinheiro	4	3	3	2	3	15	Medium

Source: prepared by the authors (2025). Legend: B1: Rarity; B2: Integrity; B3: Variety of geodiversity elements and/or associated themes; B4: Visual Quality; B5: Observation conditions.

Table 3: Result obtained from the sum of the criteria considered for defining the Tourist Value of the new hotspots identified in Carnaúba dos Dantas/RN.

Locations	**Tourist Value**						
	C1	**C2**	**C3**	**C4**	**C5**	**Total**	**Ranking**
Pedra do Alexandre	1	1	1	0	4	7	Low
Vulcanismo Volta do Rio	1	0	1	0	3	5	Very Low
Talhado do Gavião	1	0	1	1	4	7	Low
Casa Santa	1	0	1	1	4	7	Low
Cachoeira do Chapéu	1	0	1	0	4	6	Low
Pedra do Dinheiro	2	4	1	1	3	11	Medium

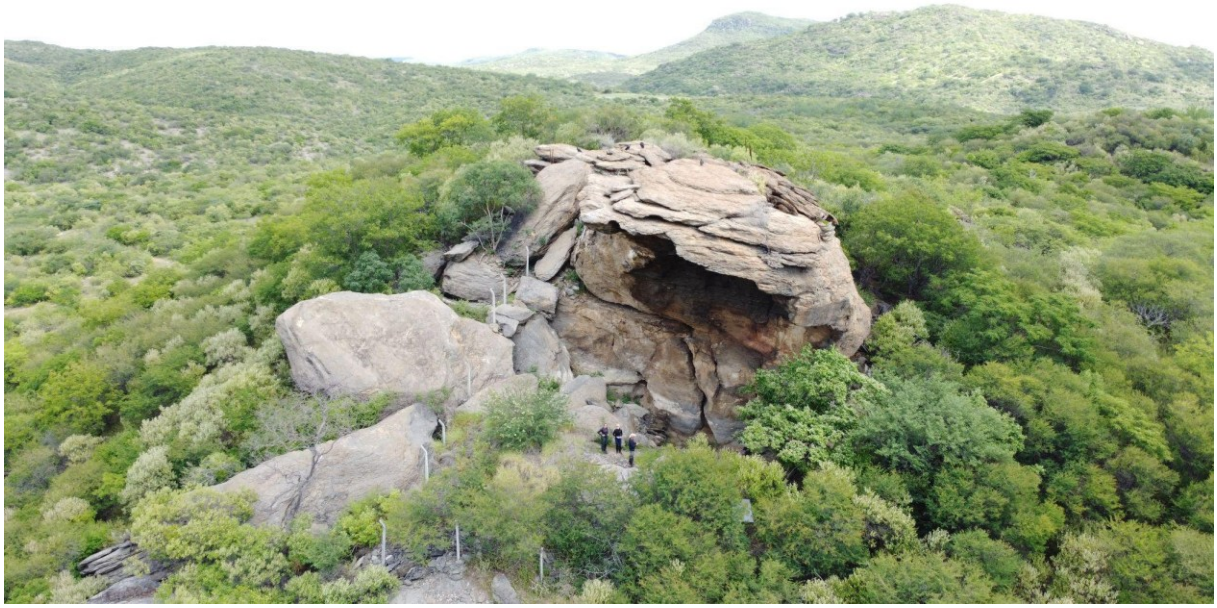
Source: prepared by the authors (2025). Legend: C1: Accessibility; C2: Presence of infrastructure; C3: Existence of ongoing use; C4: Scenery; C5: Tourist category.

The following section describes the qualitative and quantitative assessments of the geoheritage for each location visited in the municipality of Carnaúba dos Dantas, Rio Grande do Norte.

4.1. Pedra do Alexandre

Pedra do Alexandre is located in Povoado Ermo (Figure 2), near the right bank of the Carnaúba River, in the rural area of Carnaúba dos Dantas. It is accessed by a dirt road that leads to a trail of approximately 2.5 km, which, near the geosite, begins to have slightly steep terrain and dense forest, presenting a medium degree of difficulty of access.

Figure 2 – Geoform known as Pedra do Alexandre, Povoado do Ermo, municipality of Carnaúba dos Dantas/RN.



Source: authors' collection (2025).

The history of the creation of Pedra do Alexandre dates back to 1920, when José de Azevedo Dantas, a local resident, collected information about the occurrence of sites with paintings and engravings in the region, mainly in the area of the Bojo stream, recorded in his diary "Indícios de uma Civilização Antiquíssima" (Evidence of an Ancient Civilization), published in 1994 (LUNA; NASCIMENTO, 1998).

The site features rock paintings on a rocky surface with a linear extension of approximately 5.5 m (MUTZENBERG, 2005). The paintings found have characteristics of the Northeast Tradition, Seridó Subtradition, representing everyday life, ceremonies, and rituals, with themes of sex, violence, and hunting. These paintings are red in color and range in size from 5 to 15 cm (MARTIN, 1982). However, they fit into the Agreste Tradition, as they are found in an isolated and more protected location. Due to the effects of weathering on the lithology (mica schist), the paintings are wearing away, making them difficult to see.

The Pedra do Alexandre is a microform associated with displacement and dissolution, that is, it constitutes an elongated and horizontal basal *tafone*, an erosional recess in the form of a shelter, developed along surfaces of metamorphic foliation planes and/or pegmatite veins, intruded into the mica schists of the Seridó Formation (MEDEIROS *et al*., 2025).

In the quantitative assessment, Pedra do Alexandre presented high scientific value in view of a high degree of knowledge, exposing relevant research such as the works developed by Martin (1996), Silva and Solari (2020), for example, as well as having significant abiotic diversity, such as *tafone*, fractures, gouges, dissolution, among other elements.

Its aesthetic value was also considered high, making the place a geosite according to the central criteria. These values stood out mainly due to the excellent conditions for viewing the abiotic features associated with the site and also due to the relevance of having up to three examples in the area within the same geomorphological context within a radius of 200 km.

The tourist value score was low, given the difficulty of access, the presence of nearby infrastructure, and visitor support facilities. However, it is an area that can be explored, but sustainable and tourist measures are needed to improve visitation.

4.2. Vulcanismo Volta do Rio

The Volta do Rio volcanic complex is located approximately 7 km from the center of Carnaúba dos Dantas, specifically on the bed of the Carnaúba River, on the Volta do Rio site (private property). It is easily accessible by road, but there are no signs, meaning there is no support for tourists (Figure 3).

The Volta do Rio Volcanism received this name due to the lithological control provided by the intrusion of magmatic material associated with Macau volcanism (basalt). This basaltic outcrop has a convex geometry, forming a plug embedded in mica schist and quartzites of the Seridó Group, which, due to its greater resistance to fluvial erosion, provided a drainage anomaly (recurved section) in the main channel of the Carnaúba River. During dry periods, a small trail of ≈500 m can be made in its channel to the location of the basaltic outcrop, which is black in color and has an aphantic texture, and may contain millimeter-sized olivine phenocrystals (BARROS *et al*., 2021).

Figure 3 – Outcrop of Macau magmatism on the bed of the Carnaúba River, at the Volta do Rio site, municipality of Carnaúba dos Dantas/RN.

Source: authors' collection (2025).

The scientific value score was considered low, mainly due to the lack of scientific studies on the area, which hinders the dissemination of knowledge. In addition, there is a low diversity of abiotic elements. However, the representativeness and paleogeographic value are high, highlighting the scientific importance, which can be explored in geoscience research.

In terms of aesthetic value, the score was considered high, presenting good conditions for viewing the abiotic elements of interest, a considerable variety of geodiversity elements, such as geology, petrology, hydrology, and pedology, which can add to the explanation of the area. For tourist value, the quantification was very low, as there are no elements or infrastructure to support visitors.

4.3. Talhado do Gavião

The Talhado do Gavião geosite is located approximately 8 km east of the center of the municipality of Carnaúba dos Dantas, at Sítio Lajedo (Figure 4). It is accessed by a dirt road leading to the headquarters of a private property, where there is a small, difficult-to-access trail to the "Serra do Talhado do Gavião" mountain range, one of the reasons why it received a low score in terms of tourist value, as well as having no nearby support.

Figure 4 – Panoramic view of the Talhado do Gavião geosite, Carnaúba dos Dantas/RN.

Source: authors' collection (2025).

Talhado do Gavião (Figure 5) is a tafoni located on a steep outcrop, associated with mica schists from the Seridó Formation, whose origin is associated with chemical weathering (cavernous weathering) along the fracture and foliation planes of the mica schists, surfaces of discontinuity, where environments of greater humidity are established, providing the expansion of cavities by dissolution. Inside the tafoni, it can be observed that the presence of dikes and fractures that section the mica schist cause displacements that enhance the expansion of the cavity, as well as weathering niches.

The Talhado do Gavião, with its elongated and horizontal shape, has cave paintings inside, indicating occupation by prehistoric peoples (MEDEIROS *et al*., 2025). The paintings found inside this cavity have characteristics of the Northeast Tradition, Seridó Subtradition, but also fit the Agreste Tradition, as it is located in an isolated place.

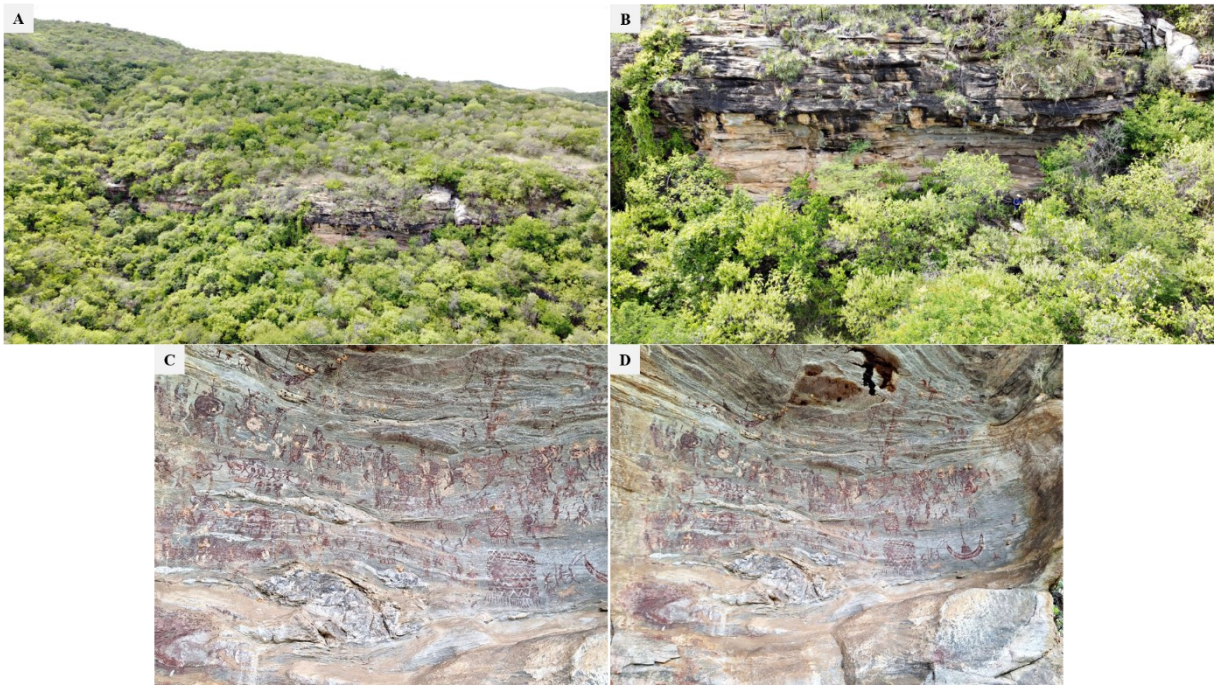
In terms of scientific value, Talhado do Gavião obtained the second highest score because it has already been cited in works such as that of Silva (2024), also presenting significant geomorphological characteristics. It also scored high in aesthetic value, as it is a geosite with three relevant sites within a 200 km radius, offering an excellent view of abiotic features, a landscape with a stunning viewpoint, and a spectacular aesthetic setting without deterioration.

Its tourist value score was low due to its difficult access, lack of infrastructure, and lack of visitor support. However, it is a place that can be explored, but it needs tourist and sustainable measures to improve visitation.

4.4. Casa Santa

Located in Serra Fechada, approximately 9 km from the municipality of Carnaúba dos Dantas, Casa Santa (Figure 5) is a negative *tafone* collapse cavity on an escarpment bordering the Bojo stream, whose genesis is mainly related to fractures parallel to the foliation of the quartzites of the Equador Formation, leading to the detachment and collapse of blocks. This foliation is defined by the alternation of bands richer in quartz with bands richer in muscovite (CAVALCANTE NETO, 2008).

Figure 5 – (A and B) Panoramic view of the Casa Santa geoheritage. (C and D) Cave paintings inside the "Casa Santa" tafoni.



Source: authors' collection (2025).

This geoheritage is located at an altitude of ≈434 m, with difficult access, which is one of the reasons why it received a low score. Access is via a dirt road over the residual ridge "Serra Fechada," which leads to a ≈2.5 km trail through dense forest toward the feature. In this cavity, rock paintings (Northeast Tradition) can be observed, one in particular resembling an angel. Given this, residents took sick children there to pray, believing they would get better, hence the name Casa Santa (Holy House) (MEDEIROS *et al*., 2025).

Casa Santa obtained the third highest score in scientific value because it is cited in works such as Cisneiros; Nogueira (2022), housing elements of geomorphological processes and presenting a diversity of abiotic elements of ecological interest and great representativeness.

In terms of aesthetic value, it scored highly because it is a place without deterioration, with a vertical landscape and good viewing conditions, which houses a variety of geodiversity elements and offers good viewing quality from the lookout point. In terms of tourist value, it scored low because it is an area without signage, difficult to access, without accessibility and infrastructure, but which has strong potential for exploration.

4.5. Cachoeira do Chapéu

Chapéu Waterfall (Figure 6) is located approximately 7 km from the center of the municipality of Carnaúba dos Dantas (Sítio Braz), on the bed of the Olho d'Água stream. This geoheritage corresponds to a quartzite block that was isolated from the main rock body due to rupture deformation planes exploited by the fluvial incision of the Olho d'Água stream, and which has been shaped by abrasive wear at its base (corrosion). This geoform gives rise to a pareidolia that resembles a hat, hence its name. Abrasion smooths and polishes the base of the quartzite block, as well as breaking its edges. In this feature, red and white rock paintings can also be observed, which are characteristic of the Northeast and Agreste Traditions of the Seridó Subtradition (MEDEIROS *et al.*, 2025).

Figure 6 – (A) Partial view of Chapéu Waterfall, from the bed of the Olho d'Água stream, Sítio Braz, Carnaúba dos Dantas/RN. (B) Quartzite geoform (castle koppie) on the bed of the Olho d'Água stream, which gives its name to a small waterfall called "Chapéu Waterfall."

Source: authors' collection (2025).

Chapéu Waterfall obtained an average score in scientific value because it is a place that has not yet been explored in scientific research, but which presents elements of geomorphological processes and their evolution.

In terms of aesthetic value, it scored highly because it offers good viewing conditions, has not deteriorated, and presents a variety of geodiversity elements. The low score for tourist value was due to the lack of tourist infrastructure, lack of accessibility, and the fact that it is not a well-known location, but it does offer tourist categories to be explored.

4.6. Pedra do Dinheiro

The Pedra do Dinheiro (Money Stone) (Figure 7) is located on the outskirts of Carnaúba dos Dantas and can be easily accessed by a dirt road. This microform gets its name from an ancient legend that tells of a golden ram appearing near the stone at midnight.

This geoheritage is a pegmatitic microform, a castle koppies or inselberg, characterized by a massive lower part and an upper part formed by stacked blocks (less rounded), forming a castle-like feature (MEDEIROS *et al*., 2025).

Figure 7 – Panoramic view of Pedra do Dinheiro, Carnaúba dos Dantas/RN.

Source: authors' collection (2025).

Pedra do Dinheiro obtained an average score in both categories. In scientific terms, it is cited in works such as Taveira (2023), contains illustrative elements that represent sections of the type of formation, but has anthropic interference, and is suitable for educational purposes for elementary school and the general public.

In terms of aesthetic value, it is a unique specimen, or one of only three within a 500 km radius. It has a landscape that can be seen from the outside and is suffering from deterioration. Although it is close to the city center, which has tourist support, it is a place that does not appear in campaigns and has no signage.

5. Conclusion

The municipality of Carnaúba dos Dantas has several sites of geological interest, where geological and geomorphological elements stand out, including microforms carved in mica schist, quartzite, and pegmatite, such as archaeological sites, featuring rock shelters with cave paintings and engravings, presenting significant geotourism potential, in addition to the geosites that make up the UNESCO Seridó Global Geopark.

The methodology used in this research proved to be an effective tool for identifying rocky relief geosites and a valuable contribution to the knowledge of the geoheritage of the municipality of Carnaúba dos Dantas. It showed that it has the ability to recognize specific characteristics that other methods did not consider.

The issue of low scores in terms of tourist value is concerning, as, to date, these geosites are not protected by legal regulations at various levels of government, resulting in a situation of high environmental vulnerability. Therefore, it is of utmost importance to implement activities associated with geotourism and develop technical and legal instruments aimed at their conservation, such as geotourism visitation plans, including mapping of interpretive and self-guided trails, which are adapted to the carrying capacity of each geoheritage site.

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