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GEOHERITAGE OF TERRAS DE CAVALEIROS ASPIRING GEOPARK (NE PORTUGAL): INVENTORY AND ASSESSMENT

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The Macedo de Cavaleiros municipality is preparing a new geopark project in NE Portugal with the scientific support of the universities of Minho (Braga) and Trás-os-Montes e Alto Douro (Vila Real). Terras de Cavaleiros (Lands of Knights) aspiring geopark (TCAG) has an area of about 700 km^2 corresponding to the administrative limits of Macedo de Cavaleiros municipality (figure 1). This work presents the geoheritage of this territory as the result of a detailed geosites inventory and assessment made by the University of Minho team.

Fig. 1. Location of Terras de Cavaleiros aspiring geopark (TCAG).

The territory of TCAG has a rich and complex geodiversity, mainly expressed by the following geological units, structures and landforms:

i) Pre-Mesozoic allochthonous geological units, namely:
- Allochthonous Ophiolitic Complex, a complete sequence of the oceanic crust constituted by several types of mafic and ultramafic rocks;
- Allochthonous Upper Complex, representing a whole sequence of continental crust from an ancient continent located far away from the autochthonous domain. This complex is represented by metasediments, orthogneisses, and mafic and ultramafic rocks;
- Major tectonic features, namely thrust faults that marks the contacts between the autochthonous and allochthonous units.
ii) Hercynian granites.
iii) Cenozoic sediments representing an ancient drainage system.
iv) Push-up tectonic relieves and strike-slip basins filled by the Cenozoic sediments.

v) Active faults related with the Cenozoic sedimentation and the tectonic relieves.
vi) Incised river valleys as the result of a capture process of the ancient Cenozoic endorheic drainage by the present-day Atlantic drainage system.

The geosites inventorying of TCAG has started with the identification of potential geosites based on bibliographic research, fieldwork and previous knowledge of the area. Eighty-two potential geosites were identified related with mineralogical, petrological, tectonic, geomorphological and hydrogeological occurrences. These 82 geosites were assessed taking into account several criteria corresponding to:

- Scientific value (representativeness, rarity, integrity, scientific knowledge)
- Additional values (ecological, cultural, aesthetic, educational);
- Use values (accessibility, visibility, present type of use, presence of natural and cultural features, legal protection and use restrictions, existent infrastructures);
- Protection values (conservation state and vulnerability).

The application of these criteria to the 82 geosites has resulted in the selection of 34 geosites. The scientific value was considered of utmost importance. The 34 geosites are included in 6 of the 27 geological frameworks that were defined for the Portuguese inventory of the geological heritage, namely: The Iberian W-Sn Metallogenic Province, Pre-Mesozoic granitoids, Exotic Terranes of NE Portugal, Landforms and river network of the Portuguese Iberian Massif, Karst systems of Portugal and Neotectonics in mainland Portugal.
The scientific value and vulnerability of the 34 geosites were then assessed in order to determine geoconservation priorities. The adopted methodology was the same as the one used in the national inventory (table 1). The scientific value was evaluated taking into account 6 criteria with parameters scoring 0 to 4. The vulnerability assessment was based in 5 criteria with parameters scoring 1 to 4.

Criteria for scientific value	Weight	Criteria for vulnerability	Weight
A. Representativeness	30	A. Fragility of the geological elements	35
B. Key-locality	20	B. Proximity to potential damaging activities	20
C. Published scientific literature	10	C. Present protection status	20
D. Integrity	15	D. Accessibility	15
E. Geological diversity	10	E. Population density	10
F. Rareness	15		
Total	100	Total	100

Table 1. Criteria used for the assessment of the scientific value and vulnerability of geosites.

Of the whole 34 geosites, 7 of them are already listed in the national geosites inventory, which justifies their higher national/international relevance. Of the remaining 27 geosites, 19 have good scientific value and 8 have low value. In spite of this low scientific value, these geosites were included in the TCAG inventory due to their representativeness of the local geodiversity.

Concerning vulnerability, 19 geosites have high vulnerability, 8 medium and 7 low. Integrating the results of the scientific value and vulnerability, it was possible to establish priorities for the geosites management.

The high relevance of the geological heritage of TCAG is unquestionable. This region is well known by national and international geologists as one of the most interesting occurrences of the Iberian geology. The TCAG geodiversity is quite different from the other Portuguese geoparks already included in the EGN/GGN and it will be the first Iberian geopark to bring a new geological dimension to the network. The management of the most important geosites offers no major difficulties in what concerns conservation and protections issues