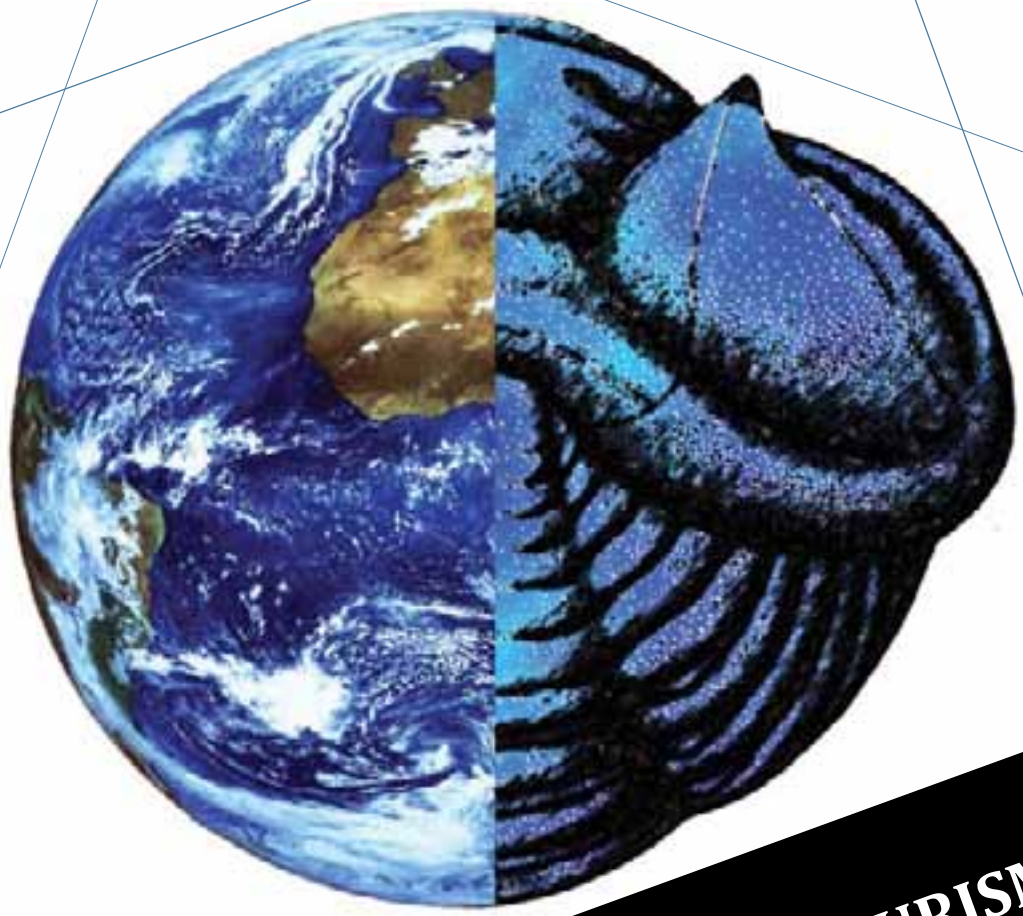

NEW CHALLENGES WITH GEOTOURISM

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GEOLOGICAL HERITAGE AND GEOCONSERVATION IN PORTUGAL

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1. Introduction

During the last decade, geoconservation in Portugal has begun to increase its importance and to make its appearance in different domains. Some of this successful approach is due to a more aware geological community working together under the scope of the national ProGEO group created in 2000. Slowly, geoconservation issues are being recognized by different sectors of Portuguese society, including politicians, teachers, park managers, geologists, etc. Nevertheless, geoconservationists still battle for the real involvement of the Institute of Nature Conservation and Biodiversity (INCB, the national institution responsible for protected areas management), which has no strategy for geoconservation. This paper aims to present a brief updated status of Portuguese geoconservation, emphasising the legal setting and the main initiatives.

2. Legal setting

During the last forty years Portugal has implemented several laws supporting nature conservation denoting, not only a significant evolution of national policies, but also the need to integrate international and European legislation into the national legal framework.

Showing a significant delay compared with other European countries, Portugal published its first nature conservation law in 1970, the European Year of Nature Conservation. One year later, the first protected area was created – the Peneda-Gerês National Park – about one century after the establishment of the Yellowstone National Park, considered the first national park in the world.

Nevertheless, Portuguese environmental legislation began to include geoconservation principles only in 2000. The National Strategy of Nature Conservation and Biodiversity (2001) identifies the need to increase knowledge, conservation and interpretation of geological heritage. Also, the Land Use Policy National Program (2007) recommends direct action for the characterization and classification of geological heritage.

But the really important legislation for geoconservation is the recent law on Nature Conservation and Biodiversity (2008). Following ProGEO-Portugal's proposals, for the very first time "geosites" and "geological heritage" are correctly defined and their conservation justified as one of the aims for the management of protected areas. Damaging geosites inside protected areas is now considered a felony subject to penalties. In the Azores and Madeira Archipelagos there is also appropriate legislation for the conservation of geosites.

As in many other countries, fossils are considered a cultural heritage and therefore are also protected under the respective law. Finally, the European Landscape Convention and the Natura 2000 Network and National Ecological Network regulations achieve indirect geosites protection.

3. National initiatives

3.1. Geosites inventory

Present knowledge about Portuguese geological heritage is dispersed and incomplete justifying the urgent establishment of a geoconservation strategy by the geological community. For instance, a national geosites inventory has never been conducted using a systematic methodology by any institution with legal responsibility to accomplish this task. This is

the main reason why a working group comprising geoscientists from twelve Portuguese institutions is developing a three-year project aimed at the identification, classification and conservation of the most relevant geosites by Portuguese authorities. Amongst the different outcomes expected for this project (sponsored by the national science agency) we emphasize the following: i) an on-line database of the geosites representative of the Portuguese geological frameworks; ii) legislative proposals focusing on geoconservation; iii) an inventory of the most important Portuguese geosites to be submitted to national authorities, requesting their classification and integration into the National Network of Protected Areas; iv) scientific cooperation between Portuguese and Spanish geoconservationists for the identification of geosites with Iberian relevance, according to the methodology proposed by IUGS and ProGEO. This ongoing project will also deliver some public outreach outcomes, namely: i) fieldtrips, conferences, brochures for non-specialists and a web-site; ii) lifelong learning actions on geoconservation addressed to secondary school teachers; iii) report on geoconservation and geotourism to be submitted to all national authorities involved with nature conservation, land-use planning and tourism; iv) publication of an illustrated book about the Portuguese geological heritage.

The first aim of this geoconservation strategy is complete with the definition of the frameworks representing the most important geological features in Portugal and covering the different types of geoheritage, e.g. palaeontological, petrological, geomorphological, tectonic or stratigraphic heritage. Twenty-nine frameworks were defined, according to their scientific value, at both national and international levels, resulting from a discussion forum within the working group. The geological frameworks with international relevance were defined in a previous work (Brilha et al., 2005) and have been reconsidered and included in this approach.

This inventory aims to be the most complete and up-to-date information about the Portuguese geological heritage, including the list of the most relevant geosites for scientific, educational and tourism uses, and sorted according to their importance and need of conservation. Constituting the background for a national policy for geoconservation and for the acceptance of geoheritage issues in nature conservation and land-use strategies, it is also expected that this work will contribute to the enhancement of public awareness of geological heritage as an important natural resource with major strategic importance for every country.

The scientific characterization of each framework is also now complete, with the identification of the most representative geosites, which are proposed by geoscientists with expertise in each geological context.

In the Azores, the Working Group on Volcanic Caves of Azores (GESPEA), created in 2002 by the Regional Government joining experts from the local university and NGOs, is responsible for the inventory of volcanic caves in the territory. Almost 300 caves are included in the Azorean Speleological Inventory database. The inventory of geosites located inside Azorean protected areas is also complete (Lima, 2007); 59 geosites were identified, most of them with national and international scientific relevance. Regarding the Madeira Archipelago, its geological heritage is presently under study promoted by a Regional Government initiative.

3.2. Geosites conservation

Protected areas

The protected areas network covers about 8% of the surface of Portugal's mainland. Presently, there are 32 protected areas with national relevance and managed by the INCB: one National Park, nine Natural Reserves, thirteen Natural Parks, two Protected Landscapes and seven Natural Monuments. The autonomous regions of Azores and Madeira have special legislation and consequently the protected areas on these archipelagos have a slightly different categorization. Moreover, about 20% of the Portuguese territory is included in the Natura 2000 Network.

All seven Natural Monuments have been designated for their geological features. Dinosaur footprints at Ourém, Carenque, Lagosteiros, Pedra da Mua, and Pedreira do Avelino Natural Monuments; Jurassic sedimentary record of worldwide significance for Cabo Mondego Natural Monument; and Ordovician quartzite ridges for Portas de Ródão Natural Monument. Also the Protected Landscape of the Fossil Cliff of Costa da Caparica was created for geomorphological reasons. Many other protected areas present interesting geological features but, in most cases, they are not included in the management plans or conservation projects.

Geoconservation Award

Considering that the Portuguese municipalities are being more active in geoconservation compared with the INCB, the ProGEO national group implemented in 2004 the Geoconservation Award (GA) addressed to local administrations. This symbolic award aims: i) to recognise the best practices of geoconservation promoted by municipalities; ii) to foster discussion on the need for geological heritage protection; iii) to encourage municipalities to adopt strategies and procedures on geosites; iv) to raise awareness within society about the need for integration of geological heritage in nature conservation and land-use policies; and v) to promote geology in the media agenda.

The criteria taken into account in making the award to a municipality are based on the following actions: i) geosites inventorying and corresponding scientific support; ii) implementation of geosite conservation actions; and iii) valuing and interpretation strategies. Six municipalities have already received the award. The "Natureza e Tejo" Municipalities Association (2007) and the Arouca Municipality (2008) were recognized for their initiatives related with the creation of geoparks. Idanha-a-Nova Municipality (2004) was given the award after the implementation of geoconservation initiatives at Penha Garcia, a well-known geosite for its paleontological relevance. Valongo Municipality (2005) received the GA for the creation of a municipal park (Valongo Paleozoic Park) where the occurrence of trilobite fossils with high scientific value co-exists with remains of Roman mining works. Cantanhede Municipality (2006) was rewarded for the "Stone Museum", an interpretation centre devoted to all aspects related with limestone (science, geological heritage, uses, etc.). Finally, Porto Municipality received this distinction in 2009 for the conservation and interpretation facilities of the urban geosite "Foz do Douro Metamorphic Complex".

3.3. Education and training

One of the most remarkable aspects of Portuguese geoconservation is related to educational issues. The secondary school curriculum integrates the concepts of geosite and geological heritage in the Geology course. In several universities, undergraduate degrees in Geology, Geography and Biology have also some modules on geoconservation. At the University of Minho, a Masters course on Geological Heritage and Geoconservation has been available since 2005 (Pereira et al., 2008). In other universities, master courses on Geology and Geography offer optional geoconservation modules. PhD theses related with geoheritage are also being produced pushing forward the research in such domains.

Contact with the general public is also promoted. Presently, several educational and interpretation facilities are available in Portugal (table 1), despite the fact that, for some of them, the link with geoconservation is not clearly expressed.

3.4. Geoparks

As in many other countries, geoparks are not clearly defined in the Portuguese legal framework. Nevertheless, the recent law on Nature Conservation and Biodiversity acknowledges areas that are recognized by international institutions such as UNESCO (Man

and Biosphere areas, Ramsar areas, geoparks, etc.) which is already a good starting point for a future official definition.
In 2003, Portugal started the process to create its first geopark. The Naturtejo Geopark was later integrated in the EGN/GGN (2006), being one of the largest and most active geoparks in Europe. By the middle of 2009, the Arouca Geopark was the second Portuguese geopark to enter these networks, following preparatory work started three years before. Presently, new geoparks are being created, namely the Azores Geopark (under the leadership of the Secretary of Environment of the Azorean Regional Government) and the Porto Santo Geopark in the Madeira Archipelago (under the direction of the respective municipality), both with the support of national universities and Naturtejo and Arouca Geoparks.

FACILITIES	LOCATION	THEME
Algar do Carvão	Terceira island (Azores)	Volcanology
Algar do Pena	Alcanede	Karstic caves
Carsoscópio (Ciência Viva Centre of Alviela)	Alcanena	Karst features
Caves and Volcanism Centre	São Vicente (Madeira)	Volcanology
Cova dos Mouros Mining Park	Alcoutim	Mining
Ciência Viva Centre of Estremoz	Estremoz	Geology
Geological Interpretation Centre of Canelas	Arouca	Giant trilobite fossils
Geological Museum	Lisboa (Geological Survey)	Mineral, rock and fossil samples
Geological Museum	Vila Real (University of Trás-os-Montes e Alto Douro)	Mineral, rock and fossil samples
Interpretation Centre of Capelinhos Volcano	Faial island (Azores)	Volcanology
Interpretative Centre of Foz do Douro Geological Trail	Porto	Pre-Cambrian metamorphic complex
Iron Museum	Torre de Moncorvo	Mining heritage
Lime Route and Museum	São Vicente (Madeira)	Limestone (science/ applications)
Lourinhã Museum	Lourinhã	Dinosaur fossils
Machado Fagundes Volcanological Museum	Terceira island (Azores)	Volcanology
Mineralogical and Geological Museum	Coimbra (University of Coimbra)	Mineral, rock and fossil samples
Mountain House	Pico island (Azores)	Volcanology
National Natural History Museum	Lisboa	Mineral, rock and fossil samples
Ourém/Torres Novas Natural Monument	Fátima	Dinosaur footprints
Palaeozoic Park	Valongo	Trilobite fossils and mining heritage
Serra da Estrela Interpretation Centre	Seia	Granitic landscape and glacial morphology
Stone Museum	Cantanhede	Limestone (science/ applications)
Torres Cave	Pico island (Azores)	Volcanology (lava tubes)
Volcanological and Geothermal Observatory of Azores	São Miguel island (Azores)	Volcanology

Table 1: Portuguese educational and interpretational facilities, directly and indirectly, related with geological heritage.

4. Final considerations

Little by little geoconservation in Portugal is gaining strength: the geological community is considering this new topic as an applied science with relevance for research and teaching; the legal tools are now more suitable for the protection of geological heritage; students in schools and universities come in contact with relevant concepts; there is specific training for geoconservation experts; park managers and local politicians are more aware of this subject; and the general public is more receptive to the geosciences. All these successful steps are due to the development of collaborative work between experts from different institutions grouped together under the ProGEO-Portugal structure. Nevertheless, there are still two major faults: there is no structured strategy integrating the inventory, conservation, valuing, interpretation and monitoring of geosites, and there is no proper national institution responsible for the implementation of such a geoconservation strategy. Despite this, the first flaw is being taken care of by an ongoing research project; the second one is more difficult to resolve because it is entirely dependent on political decisions.

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