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# Sommario

<b>PLENARY SESSION - INVITED SPEAKERS</b>	5
<b>GEOSITES</b>	9
<b>GEOLOGICAL HERITAGE AND LAND-USE PLANNING</b>	90
<b>GEOPARK AND GEOTURISM</b>	130
<b>COOPERATION AND EDUCATION</b>	180
<b>FIELDTRIP GUIDES</b>	210

**In copertina:** Il promontorio di Capo Colonna Area calanchiva di Aliano

# Geoconservation education, research and outreach: the experience of the University of Minho (Portugal)

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## ABSTRACT

**G**eoconservation is an emerging geoscience. In order to gain recognition among the scientific community and in society in general, education lato sensu is of paramount importance. This work presents the experience of the University of Minho with geoconservation education during the past 10 years, namely with graduation and post-graduation courses, teachers training, research, and outreach. Working in those different levels enhanced the university internationalisation with an increase in students and staff exchange. In order to reinforce worldwide recognition universities should strengthen their strategy towards geoconservation by creating courses and developing research projects.

**KEYWORDS: GEOCONSERVATION; EDUCATION; RESEARCH; OUTREACH; UNIVERSITY OF MINHO**

## INTRODUCTION

Geoconservation is an emerging geoscience requiring further recognition by the general public and even by the geoscientific community (Henriques et al., 2011). The promotion of geoconservation education is a factor of great importance to broaden this recognition (Van Loon, 2008). The University of Minho (UMinho) in northern Portugal already has a significant history in geoconservation education. UMinho is one of the so-called "new universities" that were created in Portugal during the transition of the dictatorship to democracy. With two campi in Braga and Guimarães, UMinho is a middle-size university created in 1973. Today it has around 18,000 students and 1,100 members in the academic staff. The first works concerning geoconservation were developed in 1996 in the Earth Sciences Department. This research was related with the inventory of geological heritage in Alvão Natural Park under the scope of a master thesis on Environmental Sciences (Branco, 1996). In 2003, the Earth Sciences Research Centre started a research line dedicated to geoconservation supporting

the development of more structured studies in this domain. The present activity on geoconservation at UMinho integrates teaching, teachers training, research and outreach.

## GEOCONSERVATION TEACHING

Geoconservation subjects are taught both in graduation and post-graduation courses. In what concerns graduation, there are optional courses (5 ECTS) on geodiversity and geoconservation for Geology, Biology and Geography.

Considering post-graduation, the university offers a master degree on Geological Heritage and Geoconservation since 2005 (Pereira et al., 2008a; 2009). Since then, around seventy students have enrolled in this master with an average of 10 new students each year. As far as we know, this 2-years degree (120 ECTS) is the only post-graduation degree in the world totally dedicated to this geoscience domain. During the first year, students have to complete several multidisciplinary modules such as Geodiversity; GIS and computers applied to geoconservation; Inventorying, conservation and interpretation of geological heritage; Environmental legislation; Geotourism; Education for sustainable development; and Mining heritage, among others. The second year is dedicated to the preparation of a dissertation or project. The research produced in some of the dissertations became the backbone of several books that were published in different contexts (Alfama et al., 2008; Catana, 2009; Sá et al., 2008).

After finishing their master degree, students are getting jobs as geoconservation experts in geoparks, protected areas, natural history museums, and also as teachers in secondary schools and in universities. Some students decide to follow their studies and enrol in PhD programmes.

An optional course on geotourism is also offered in the master on Tourism and Cultural Heritage.

UMinho is also engaged with geoconservation at the PhD level. Several theses have been produced focused of themes centred in

Portugal (e.g. Pereira, 2006), Cape Verde (Pereira, 2010a) and Brazil (e.g. Pereira, 2010b). This last one concerns geoconservation in Chapada Diamantina (Bahia, Brazil) and was awarded in 2011 the best thesis in "Technologies and Natural Sciences" by the House of Latin America/Bank Totta Santander.

UMinho experience on geoconservation education has enhanced international exchanges with other universities with the support of different grant programmes like Erasmus and Al an (both from the European Union) and Gulbenkian (from Portugal). While Portuguese students have travelled to Brazil and Greece, UMinho has received students from Argentina, Brazil, Cape Verde, Chile, Mozambique, and Thailand. Staff mobility includes countries like Greece, Spain, Switzerland, Turkey, United Kingdom, and United States of America.

## TEACHERS TRAINING

In Portugal, geology and biology have the same importance in the secondary school curricula (namely, the number of teaching hours per week). Therefore, having teachers with a solid scientific and pedagogical background in these natural sciences has the highest relevance. UMinho has been committed in teachers training for more than 30 years giving degrees and organising lifelong training activities for in-service teachers. The Earth Sciences Department has been organising lifelong training sessions dedicated to geoconservation subjects. These sessions consist of lectures where the main concepts concerning geoconservation are presented and discussed and of fieldtrips where teachers learn how to use geosites with educative value in their classes.

## RESEARCH

The Earth Sciences Centre has been developing fundamental and applied research on geoconservation. This research is produced under the scope of master and PhD theses, sponsored research projects, and contracts. The main research project coordinated by UMinho in this area took place between 2007

and 2010 and was sponsored by the Portuguese Foundation for Science and Technology (Brilha et al., 2008; 2010). The project involved more than seventy experts from the vast majority of Portuguese geological institutions and has produced among other outputs the first systematic inventory of Portuguese geological heritage based on geosites scientific value. During recent years, researchers from UMinho have been developing research mainly related with concepts and methodologies to be employed in the quantitative assessment of geological heritage (e.g. Pereira & Pereira, 2010). More recently, they are also engaged in the definition of methodologies for geodiversity assessment and cartographic representation of a geodiversity index (Forte et al., 2012; Pereira et al., 2012).

### OUTREACH

Another goal of UMinho is to increase public awareness of geoconservation. In order to promote public awareness several strategies have been put into place: guided fieldtrips to selected geosites, participation in TV documentaries and radio shows, lectures for general public and for school children, and edition of written publications (e.g. Alfama et al., 2008; Pereira et al., 2008b; Brilha & Pereira, 2011).

In spite of the low number of staff members involved in geoconservation, UMinho already has a remarkable experience which was built during the last 10 years. The work done in different academic levels (graduation, master and PhD) and for different types of public is a strategy to prepare the Portuguese society for future geoconservation challenges.

### ACKNOWLEDGEMENTS

This work is developed in the Earth Sciences Centre of the University of Minho and in the Geology Centre of the University of Porto and sponsored by the Science and Technology Foundation (Project PEst-OE/CTE/UI0039/2011).

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