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Nature Conservation, Land Use Planning and Exploitation of Ornamental Stones

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Synopsis

Cabeça Veada is the name of a relatively small exploitation cluster for ornamental limestones occupying an area of 98 ha in the Portuguese Natural Park of Serra de Aire e Candeeiros, which is also a Natura 2000 Network protected area. Supported by comprehensive geological, mining and environmental studies, a specific methodology was developed in order to address the compatibility between the long term sustainability of this industry with the preservation of existing protected natural values. The obtained land use map should allow the Cabeça Veada mineral resources to be adequately included in the municipal land use planning process.

Keywords

Nature Conservation, Land Use Planning, Ornamental Limestones, Portugal.

Introduction

The exploitation of mineral resources can only take place where they occur and their long-term availability and exploitation depends on geological, technological and market conditions, but also on the constraints imposed by land use policies and practices. Nevertheless, despite their importance, they are often overlooked in land use plans, thus limiting their access by the mining industry. Concerted efforts by the Portuguese authorities and the industry have allowed the implementation of several good practices seeking the integration of mineral resources in land use planning policies and tools. We present an example of such good practice in a specific mining site known as Cabeça Veada, located in the Natural Park of Serra de Aire e Candeeiros (NPSAC), Portugal, where the main issue was to find the best way to make the mining activity compatible with nature conservation.

Setting

The NPSAC is also a designated Site of Community Importance (SCI) of the Natura 2000 Network since 2000 (Ref. PTCON0015). It is located in an uplifted limestone massif of the Lusitanian Basin, Portugal (Wilson et al., 1989) (Fig. 1), where several lithostratigraphic sections of Jurassic formations outcrop in extensive areas. The sections of Middle Jurassic age mainly consist of light cream-coloured limestones formed under very specific palaeo environmental conditions, leading to their occurrence as massive limestone bodies (Azerêdo, 1998). These are exploited as 2 m^3 to 6 m^3 blocks for ornamental/high-value applications in about 100 open pits (Carvalho, 2012).

Quarrying in NPSAC is one of the fundamental economic activities with local and regional impact, supporting one thousand direct jobs and generating wealth of over €100 million. Ornamental limestones exploited and transformed here are exported all over the world. The quarries are not dispersed; instead, they are clustered in five main exploitation areas of suitable stone quality, being the Cabeça Veada site one of them.

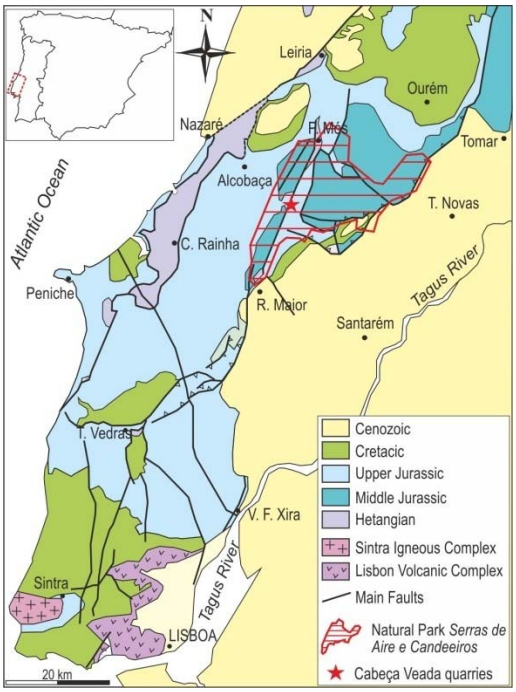

Fig. 1 Geological setting of the Cabeça Veada quarrying site and NPSAC in the Lusitanian Basin (adapted from the Portuguese Geological Map, 1:1,000,000, edited by LNEG-LGM).

Methodology and Results

According to the legal management rules of the NPSAC, the Cabeça Veada site should be subjected to detailed land use planning at the municipal level aimed at the establishment of compatibility measures between rational mining activity, the environmental restoration of degraded areas and the conservation of existing natural values. Taking into account these objectives, the adopted methodology was based on comprehensive geological, mining and environmental studies.

The first working phase consisted of the acquisition of geological, mining and environmental data for characterization and diagnostics. The geological and environmental studies were carried out at a 1:2.000 scale, as legally required for this type of land use planning maps. The geological studies comprised: i) thematic geological mapping oriented to ornamental limestones, ii) fracturing studies, iii) hydrogeological studies, and iv) diamond drilling.

The environmental studies consisted of: i) characterization and mapping of vegetation units, giving particular emphasis to the survey of flora species more relevant for conservation within the NPSAC, ii) identification of fauna species, iii) identification, characterization and mapping of biotopes and habitats, and iv) identification of geological heritage sites.

Natural value maps were produced for flora, fauna and habitats. They resulted from the valuation of criteria such as the occurrence of species and habitats listed in the birds and habitats directives. The relevance of each natural value in the produced maps was expressed on an ecological relevance scale, from Low to Exceptional.

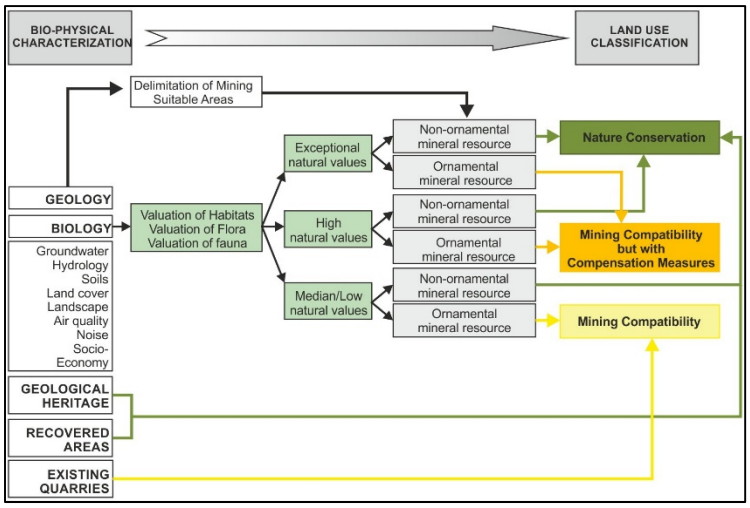

Fig. 2 Methodology for the compatibility between quarrying and nature conservation on land use planning.

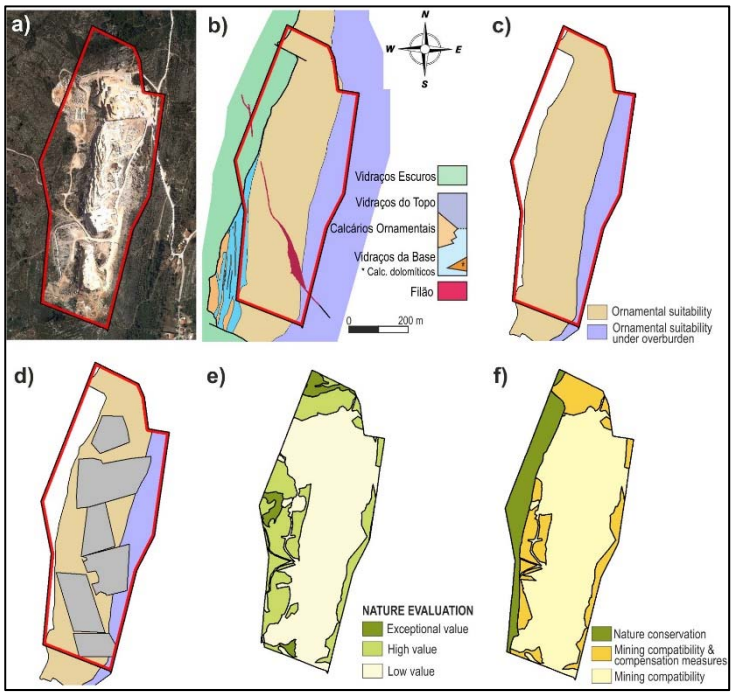

Fig. 3 Results from the geological and environmental studies carried out at the Cabeça Veada site: a) aerial view of the quarrying site; b) geological thematic mapping; c) delimitation of the suitable areas for limestone quarrying; d) existing licensed quarries; e) GIS integration of the natural values evaluation process; and f) land use spatial planning proposal for the Cabeça Veada site.

The second working phase was directed to the integration of all spatial data, making use of GIS support. The main focus was the coexistence of limestones suitable for ornamental purposes and other natural assets previously valued by means of qualitative and/or quantitative criteria, as presented in Fig.2. The main intermediate results achieved through this methodology as well as the final land use planning proposal for the Cabeça Veada site are presented in Fig.3.

Final Remarks and Conclusions

The planning map proposal yielded for the Cabeça Veada area is just one step of the whole process of including its mineral resources in the formal municipal land use planning. Nevertheless, it is extremely relevant as a scientifically based support for the political decision. It represents also a turning point in the relationship between mining industry stakeholders and environmental protection authorities after more than 20 years of land use conflicts. Working in a collaborative way, it was possible to accomplish a balance between nature conservation policies and the mining industry. Furthermore, it demonstrates how crucial geological knowledge is for the suitable practice of land use planning, achieving supporting solutions that prevent the sterilisation of mineral resources, thus contributing to the sustainable supply of mineral raw materials to Europe from domestic sources.

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