GEOSITE MANAGEMENT IN GEOPARK NATURTEJO DA MESETA MERIDIONAL
PORTUGAL

GEOMORPHOLOGICAL VIEWPOINTS

GESTION DES GÉOTOPES DU GEOPARK NATURTEJO DE LA « MESETA » MÉRIDIONALE
PORTUGAL

BELVÉDÈRES GEOMORPHOLOGIQUES

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ABSTRACT

Naturtejo Geopark, European and Global Geopark under UNESCO, has a wide geological heritage, with 28 viewpoints listed in the Inventory of Geological and Geomining Heritage (IGGH). These are privileged sites for raising public awareness by their aesthetic value, good visibility, magnitude and combination with other heritages. Their main threats involve unrestrained and uncontrolled constructions and lack of land management, more than the human impact in sightseeing places that can be easily controled or managed.

***KEYWORDS**: NATURTEJO GEOPARK, GEOSITE MANAGEMENT, GEOMORPHOLOGICAL VIEWPONTS.*

RÉSUMÉ

Le geopark Naturtejo possède des géopatrimoines exceptionnels sur lesquels se sont développés, depuis sa création en 2006, des pratiques géotouristiques au service du développement durable de ce territoire. Déjà 170 géotopes ont été listés dans l'inventaire du patrimoine géologique et géominier (IPGG) en cours. Seize sites ont une valeur exceptionnelle si l'on combine leur intérêt scientifique, éducatif et touristique, et sont pour cela d'importance internationale. Vingt huit belvédères ont été répartis dans 2 catégories : « géomorphologie » et « tectonique/géologie structurale ». Eux-mêmes subdivisés en 5 catégories. Les belvédères sont des géotopes privilégiés pour sensibiliser le public car ce sont des sites de grande valeur esthétique, avec une bonne visibilité, et un ou plusieurs intérêts géologiques. Ces panoramas, par la visibilité qu'ils offrent sur de vastes territoires, permettent aussi d'appréhender la découverte d'autres patrimoines naturels (faune, flore) mais également des aspects historiques. Si les visiteurs et les impacts induits par ceux-ci peuvent être une menace pour ces sites, une stratégie efficace de surveillance et d'aménagement peut aisément en limiter les effets négatifs. Ces géosites ont une importance stratégique pour le géoparc car ils permettent à des visiteurs qui ne peuvent ou ne veulent pas marcher, ou pour ceux dont le temps est compté, d'appréhender rapidement et globalement le territoire du parc. Ce sont également des sites importants dans le cadre de l'éducation formelle destinée aux scolaires ou informelle destinée aux visiteurs. Mais la qualité des paysages dont dépend l'intérêt de ces belvédères nécessite la prise en compte de nombreux facteurs liés à l'importance des surfaces à contrôler en raison du nombre de propriétaires terriens, de l'ampleur des surfaces forestières, du grand nombre de plan de développement en cours. Finalement, le moins complexe reste l'aménagement des belvédères qui nécessite de les rendre accessibles et d'y développer une interprétation de qualité pour les visiteurs.

***MOTS-CLÉS** : GEOPARK NATURTEJO, GESTION DES GÉOTOPES, BELVÉDÈRES GÉOMORPHOLOGIQUES.*

Introduction

Naturtejo's Southern « Meseta » Geopark, European and Global Geopark under UNESCO, was the first Portuguese Geopark, in 2006. It is located in the center inland of Portugal, near the border with Spain, and covers an area of 4 617 km^2 distributed by six municipalities. The geological heritage of the Geopark is the testimony of earth history starting from 600 million years. It is protected and managed sustainably, under the three main goals of the Global Geoparks Network: conservation, education and sustainable development through ecotourism, including geotourism as « lever » segment (Neto de Carvalho, Rodrigues, 2010). From this important geodiversity, recognized by UNESCO, 16 sites were selected by their monumentality, spectacular and appellative significance to the general public and some of these sites can be appreciated from viewpoints. After the conservation of the sites, interpretation is one of the top priorities of the Geopark, working for raising awareness, with schools and tourists but also with local communities.

Geomorphological viewpoints as selected sites of outstanding landscapes are privileged sites to stimulate interest and raise awareness public for geomorphology (Goudi, 2002) and for geoconservation, if managed properly.

All the geosites have their specificities on conservation and all are delicate to manage but the viewpoints, as panoramic sites, are very special cases, concerning the scale, the involved area and legal frameworks, as it will be discussed in this paper.

I - Geological Heritage in Naturtejo Geopark

1 - Geological Setting

Naturtejo Geopark territory covers 5 % of the Portuguese national territory. Located in the center of the country, near the border with Spain it represents the geological history of the region since the last 600 Ma (Figure 1). It shows a Neoproterozoic-to-Lower Palaeozoic basement (Beiras Group, Ordovician to Lower Silurian siliciclastic fossiliferous formations and Lower Ordovician granodiorites) which was widely flattened by Mesocenozoic polygenic weathering-erosion evolution, but still preserving several residual reliefs such as the « Appalachian » quartzite ridges and the late-Variscan granite inselberge. The paroxysms of the alpine orogeny are recorded in intramountain basins with alluvial fan-to-fluvial sediments. The Pleistocene climate changes and neotectonics were responsible for the evolution of Tejo river hydrographical basin with deeply-incised valleys in to the peneplain and epigenic gorges, meanders, grabens, horsts, fault scarps, etc.

2 - Geological Heritage and Geomining Inventory

The Naturtejo Geopark Inventory of the Geological and Geomining Heritage (IGGH) aims (i) to protect geological heritage, (ii) to diagnose vulnerabilities and threats, (iii) to establish concrete protection measures, (iv) to promote sustainable use, (v) to raise awareness for geodiversity and geoconservation and (vi) to contribute for establishing conservation policies, management strategies and legislation. This inventory lists 170 geosites that are now being re-evaluated (for publication) and are distributed in 8 frameworks: geomorphology, palaeontology, hydrogeology, stratigraphy/sedimentology, geomining heritage, petrology/mineralogy, tectonics and museums & collections, divided in 34 categories, carefully reflecting the geodiversity of the geopark's territory.

The selection of the sites was based in (i) scientific criteria (rareness, framework, representativeness, geodiversity), (ii) conservation grade (integrity, vulnerability, legal protection, potential threats), (iii) additional values (ecological, archaeological, cultural and aesthetical assets), (iv) potential of use (accessibility, visibility conditions, geographical distribution, interpretation/services and public recognition) and (v) educational practice (exemplarity and legibility).

3 - Viewpoints within the Inventory of the Geological and Geomining Heritage

In this inventory, geosites are divided according to their extent (Pereira, 2006): isolated site, area and viewpoint, (considering in this the visualization site and the panoramic view).

Viewpoints are privileged geosites for raising public awareness. In general these are sites with

Geological context	Category	N. of viewpoints
Geomorphology	Tectonic landforms	2
	Residual reliefs	9
	Fluvial	10
Tectonic / Structural Geology	Variscan	5
	Alpine	2

Table 1 - Distribution of viewpoints based on their categories

Tableau 1 - Répartition des points de vue en fonction de leurs catégories.

aesthetic value, good visibility to one or more elements of interest, with considerable scale, combining also biodiversity and historical heritage/land use. The inventory includes 28 viewpoints in 2 frameworks and 5 categories and only 7 are not in the geomorphology context, which clearly reflects that viewpoints are favourable sites to observe geomorphology (Table 1).

In the IGGH of Naturtejo Geopark some specific criteria were analysed for viewpoints: quality of the panoramic view, degree of naturalness, quality of light (number of hours for visitation with good light).

There are viewpoints spread all over the territory (Figure 1), but the distribution is heterogeneous, concentrated through the main geomorphological positive relief structures such as quartzite crests, granite inselberge, fluvial gorges and plain surface.

Some of the listed geomorphosites were already recognized by general public, they are included in tourist circuits and several are already prepared for visitors, with panels and visitor infrastructures. Landscapes result from the combination of geodynamic processes (endogenous and exogenous) with anthropogenic agents, where the land reliefs are structuring elements (Reynard, 2005). This arrangement attracts people, even when they don't know exactly the origin of the landforms but one of the Geopark's tasks is to contribute to help visitors to interpret landscapes around and to understand their evolution in the context of geological history.

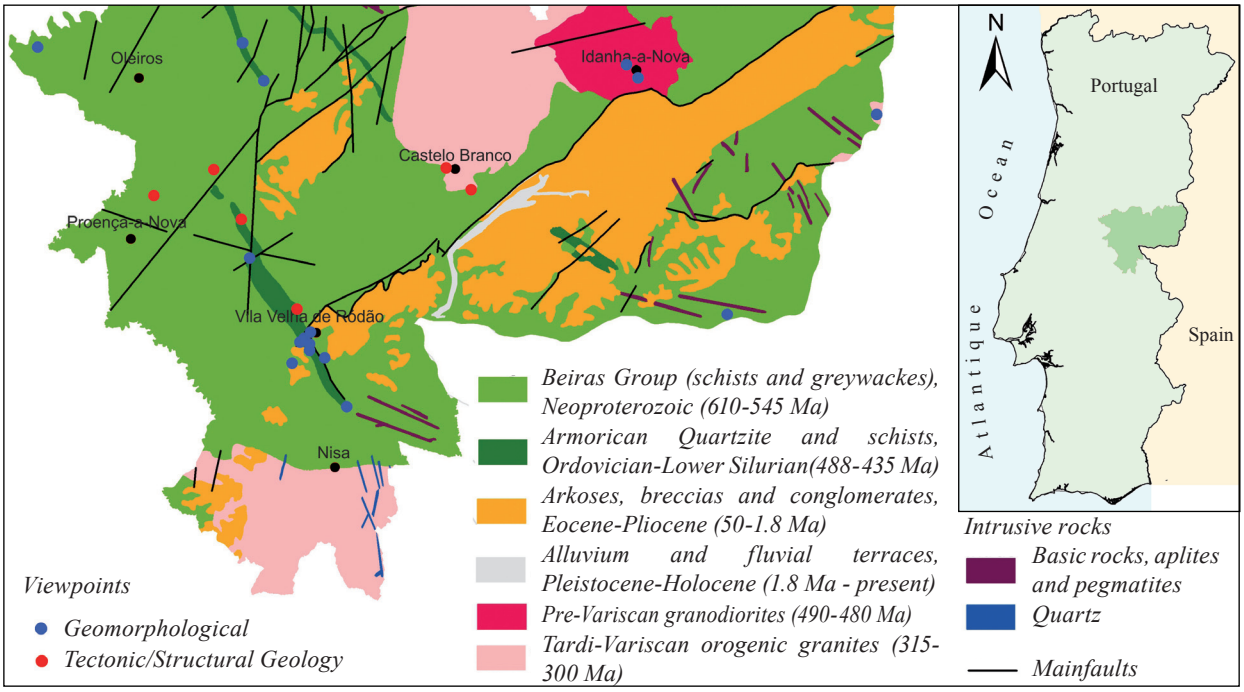

Figure 1 - Viewpoints distribution on the simplified geological map of Naturtejo Geopark.

Figure 1 - Répartition des points de vue sur une carte géologique simplifiée du Géopark Naturtejo.

II - Management of Geomorphological Viewpoints

1 - Types of viewpoints and geoconservation

a - Viewpoints as geomonuments

In Naturtejo Geopark there are 16 geomonuments, geosites with outstanding value for the general public. They are priorities for the Geopark: the municipalities and the communities recognize them as primacies and defend them when they are threaten, as it has already happened when a dam was planned to destroy Portas de Almourão geomonument, an epigenic gorge (Neto de Carvalho, Rodrigues, 2010). Some of them are truly tourist attractions for the natural and cultural landscape, and the interpretation of these geomorphosites reveals processes that most of the visitors have never heard about, like for example Mouro viewpoint through Zêzere river meanders (Figure 2 a), in fluvial category or Castelo de Idanha viewpoint from the top of the Ponsul's Fault Scarp (Residual reliefs). These sites have their own monitoring strategy and maintenance surveyed by the municipalities.

b - Viewpoints as geosites

There are 28 geosites (21 geomorphosites), included in the Naturtejo Geopark IGGH, however this involvement does not protect legally the sites, under portuguese laws. There are geosites legally protected

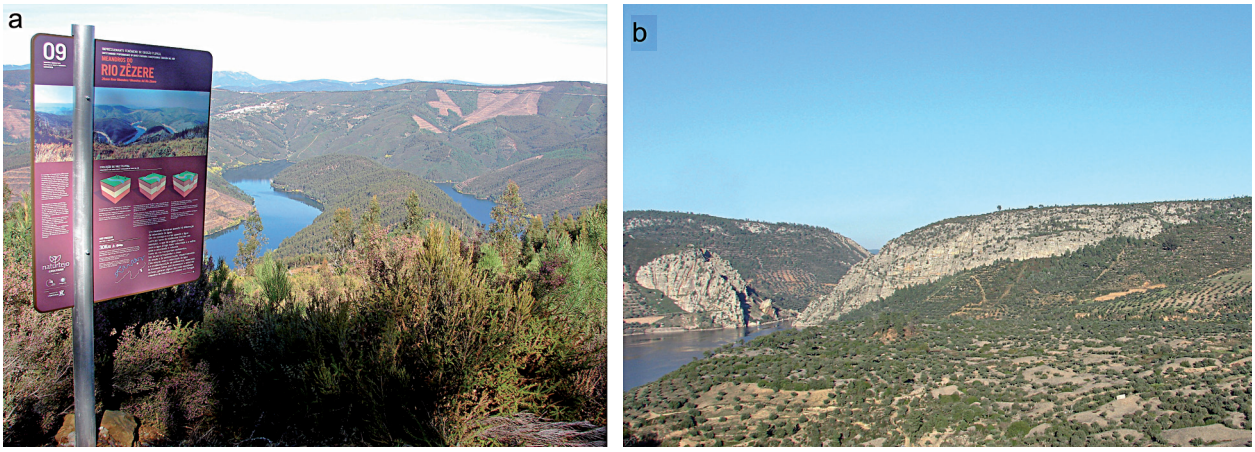

Figure 2 - a) Mouro Viewpoint through Zêzere river meander; b) Serrinha Geomorphological Viewpoint.
Figure 2 - a) Un méandre de la rivière Zêzere depuis le belvédère Mouro ; b) Le belvédère géomorphologique de Serrinha.

under several different frameworks (Rodrigues, Neto de Carvalho, 2010). Therefore, one of the main goals of this inventory is to include all the geosites in the municipal land management plans. For example, Serrinha Geomorphological viewpoint (Figure 2 b) through Arneiro graben (protected by national law within Portas de Ródão Natural Monument) provides also a panoramic view over Portas de Ródão epigenic gorge and Conhal do Arneiro Roman gold mine. For instance, Penouco de S. Miguel viewpoint (fluvial) is protected as Sites of Community Importance - Natura 2000, however in Portugal it is clearly not enough to secure the landscape.

c - Viewpoints integrated in geosites

These viewpoints are not listed in the Naturtejo Geopark Inventory because they integrate larger geosites. For example, in the Monsanto Inselberg, (Figure 3) a geomorphological and tourist ex-libris from Portugal and Naturtejo Geopark, there are several superb viewpoints. S. João or Baluarte viewpoints, all in the category residual reliefs, provide a wide view through the Mesocenozoic polygenic peneplain. They can be visited by those who walk on the « Boulders Trail ». Penha Garcia Medieval Castle viewpoint (residual reliefs) and Church viewpoint (fluvial) through Ponsul's river canyon (Figure 4 a), are another examples of viewpoints integrated in the Penha Garcia Ichnological Park geosite, and in the « Fossils Trail » one of the most preferred geotrails from the Geopark with about 11 000 visitors per year.

2 - Management and interpretation of the scenic viewpoints

a - Viewpoints prepared for self-guided visitors

The 16 geomonuments, as the main geopark attractions, are integrated in a common interpretation strategy (André *et al.*, 2011) with arriving direction signs on the road and site interpretative panels. But other geosites have site interpretation according with its geotourist and educational relevance because they are included in a walking trail, because of their previous recognition by local authorities or because their importance to the local tourist strategy. Some of them are included in walking trails focused in the landscape interpretation as in geotouristic trails (Rodrigues,

Figure 3 - Monsanto Inselberg.
Figure 3 - L'inselberg de Monsanto.

Neto de Carvalho, 2010), where the landscape is appreciated as a whole, including the traditional culture still present in the region and in the landscapes. Visitors can go autonomously with maps, leaflets, booklets, material that they can find online or in tourism offices and discover the territory.

b - Viewpoints with guided interpretation

There are viewpoints without infrastructures and interpretation for two main reasons: it is not prudent to have mass visitation of the sites because it would obligate to make big constructions and damage the site of visualization, provoking impacts in local ecosystems and in the landscape; the other reason is that they are not priorities in the moment for the territory management. Even without infrastructures and proper interpretation it is still possible to go to these viewpoints in controlled visits. Some of them have the accessibilities and minimum safety infrastructures, but some of them are included in walking trails and their guided interpretation is strategic for students in the Educational Programmes or for tourists in Tourist Programmes. Monitors don't teach, they give tools to the visitors that allow them to understand the landscape, the geological processes in Naturtejo Geopark, to support them in past time, in past space, to recognize a landform and to be able to have a general picture of the Earth dynamics.

New technologies are very important tools for viewpoints interpretation. There are already some tools implemented, such as audio guides, virtual interpretation with videos, photos and maps under the signage project (André *et al*., 2011), that can be downloaded in the geopark's website, but also virtual viewpoints (Figure 4b). The Signage project include for all the 16 main geosites direction signs on the road and site interpretative panels an digital tools, such as maps, photos, videos with explanations for the geosites. The virtual viewpoints also have have huge potential, allowing the visualization of the landscape when the weather conditions don't allow, giving different levels of information, reconstructing processes or crossing real images with sketches and models. It is possible to look for the landscape and the device, through the monitor tell us how was it formed or the name of the hills.

Figure 4 - a) Penha Garcia Ichnological Park: Church Viewpoint through Ponsul's river canyon; b) S. Gens Viewpoint (Castelo Branco) with virtual interpretation of the landscape.

Figure 4 - a) Parc ichnologique de Penha Garcia : le belvédère de Church sur la gorge de la rivière Ponsul; b) Le belvédère de San Gens (Castelo Branco) équipé d'une interprétationen en réalité augmentée du paysage.

III - Difficulties managing viewpoints

This type of geomorphosite includes not only the belvedere, site of visualization, but also the set of large scale landforms or a landscape with all its natural and cultural complexity. Most of the times, the site where the viewer is has not intrinsic value, it has value only because of the view. This «panoramic view» usually covers large areas, with an assemble of values under different threats. To preserve these geomorphosites the easiest part is to protect the site of visualization, and prepare it for visitation with accesses, view platforms or safety structures, when they are needed, as well as good interpretation. The visitors stay relatively far from the interest sites causing no direct influences on them, they only take photos and use temporarily the available sightseeing infrastructures. The few impacts they can cause are in the sites of visualization that can be minimized by a proper monitoring strategy: preserving the infrastructures, garbage cleaning, visibility and accessibilities maintenance.

The conservation of «panoramic view», of the landscape, is much more complex, than an isolated site because it is necessary to work to another scale in land management. The impact is caused by landscape management: constructions, forest disordering (uncontrolled growth of non-native vegetation), quarrying, etc.

New Portuguese legislation starting from 2008 about Nature Conservation recognized Geoparks, under UNESCO. However, they are not Protected Areas and do not have their own management plans regulated. To manage this big number of viewpoints, Naturtejo Geopark faces huge managing burocracies and obstacles: the National Management Plan, two Regional Management Plans, three Forest Management Plans, six Municipality Management Plans, Agriculture Reserves, Ecological Reserves, two National Protected Areas, four Natura 2000 areas, etc. These are tools that have already slightly started to help geoconservation but that are still far from to incorporate geosites and act effectively to protect them, especially when the issue is a large scale geomorphosite.

Another strain is to combine all the nature conservation policies with local tourist interests, because some of the viewpoints should not have too much visitors, or should not have at all, due to severely threaten fauna or flora, such as vultures and other sensitive nesting birds.

Visiting viewpoints is conditioned by sun light and weather conditions, and it is necessary to prepare alternatives, with new technologies, to the visitors who come to the territory and wish to see the landscape. Besides Interpretative Centers and infopoints, more virtual tools, such as the virtual viewpoints, could minimize some of these difficulties that the visitors may find, mainly in mountain areas.

Conclusion

Geoconservation in Portugal has not specific legislation and the protection has being done under several legal frameworks. In the last years there are improvements, but not enough, especially when it is necessary to manage a Geopark territory of 4 617 km^2 with important geological heritage to protect. Viewpoints are advantaged geomorphosites with scientific value and high educational and tourist potential, however to protect completely a panoramic view is still an impossible task for the Geopark due to limitations in the national laws. A hard work has being done by the Geopark administration and all the six municipalities over the last 8 years. The change of the position of Alvito Dam 1 km upstream in the project (and now stopped!) not to destroy Portas de Almourão geomonument and its landscape background was a very important step, which showed that priorities are changing and conscientiousness is different.

Despite the difficulties, recently several viewpoints were improved and others will be. It is being prepared a « Viewpoints Route » for a specific public who visits the territory mainly by car, that don't want or can't do it by trekking, which will connect some strategic viewpoints to create a general impression about the landscape diversity of the Geopark.

Nowadays the guided visits are already very developed, with several interpretation tools. It is necessary to keep working to prepare more and better tools and instruments for autonomous visitors.

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