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ASSESSING THE ECONOMIC VALUE OF THE PSILORITIS AREA THROUGH THE EUROPEAN GEOPARKS NETWORK INITIATIVE

Ch. Fassoulas[1,2], Z.D. Skoula[1,3]
[1]Psiloritis Natural Park, Anogia, 74051, Rethimno, Crete, Greece;
[2]Natural History Museum of Crete, University of Crete, Heraklion, 71409, Crete, Greece;
[3]Department of Applied Mathematics, University of Crete, Heraklion, 71409, Crete, Greece
E-mail: [1]geopark@psiloritis.net.gr; [2]fassoulas@nhmc.uoc.gr, [3]zskoula@tem.uoc.gr

ABSTRACT

By participating in the European Geoparks Network, Psiloritis Natural Park aims to the protection of its unique natural and cultural environment in a manner that conservation and local development can interact for the benefit of the nature and its inhabitants. The tools to achieve these are stemming from the active participation in the Network where experience in managing natural environment through the best-practices approaches developed within the UNESCO-auspiced Network are adapted to the local individualities. The scientific and aesthetic value of the broad natural environment and culture are recognised as a tourism-related and educational capital that should be managed in a sustainable way. Thus actions are taken to support alternative tourism in its various forms (geotourism, ecotourism etc.), as well as educational projects that could balance the lack of other development resources in the area.

1. INTRODUCTION

Psiloritis mountain in central Crete is not only the highest mountain in the island but also a place of high environmental variety and diversity. Intense geological processes have sculptured for millions of years a unique and complicated bedrock over which life migrated and developed adapting its features and behaviors to the changes of surface and landscape. Most of the mountainous area is thus included in the Natura 2000 List basically due to the high endemism of flora and fauna and the variety of natural habitats that have to be conservated. In 2001 the broader Psiloritis area became a full member of the European Geoparks Network mainly due to its wide geodiversity (Figure 1).

The term geodiversity was recently induced in the international literature in an effort to describe, in the same way that biodiversity does, the wide natural range (diversity) of geologic (rocks minerals, fossils), geomorphologic (landform, processes) and soil features [1], including their assemblages, relationships, properties, interrelations and systems. Although abiotic environment is one of the main parameters of nature, the degree of its conservation globally has been much smaller than the one of biodiversity. Many international nature conservation organisations used the term “nature conservation” to refer mainly to the “wild life” conservation, focusing most of their attention on it [2]. However, geological and geomorphological conservation efforts in Europe, Australia and other places worldwide started a century ago focusing on either landforms and geological formations or structures [1].

International organisations such as the International Union for the Conservation of Nature (IUCN), UNESCO and the International Union of Geo-Sciences (IUGS) have recently established certain projects to include geodiversity to their nature conservation policies. More specific, UNESCO presented an initiative called *Geoparks* to enhance the value of the nationally important geological sites, while IUGS together with UNESCO established in 1995 a project named *Geosites* to compile a global list of the world's most important geological sites [1]. The latter has recently resulted to a list of the most important geological sites of south-eastern Europe [3].

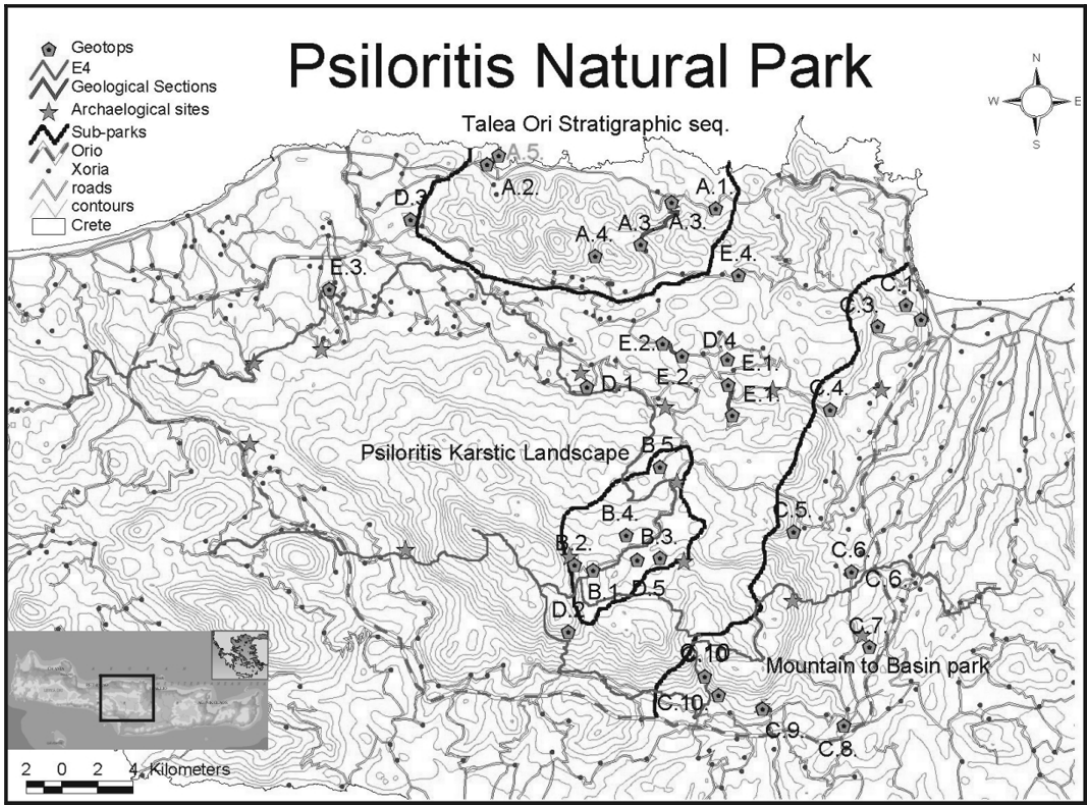

FIGURE 1. Psiloritis Natural Park in central Crete. Dashed line, park's boarder; solid dark lines sub-park's boundaries. Pentagons show geotops.

A new initiative, the *European Geoparks Network*, was created in 2000 through the LEADER program by four European territories (namely Spain, France, Germany and Greece) and was immediately put under the auspices of UNESCO. The initiative aims to manage both abiotic and living nature, including cultural heritage, in certain European territories in order to achieve high standards of conservation, promotion and finally true economic development [4]. According to the existing convention (charta), a European geopark must have a specific geological heritage covering a substantial area where an economic strategy, funded by EU programmes, occurs. It must comprise of geological sites of special value and sites with special ecologic, archaeologic, historic and cultural value. The geopark has to enforce local population to re-evaluate their heritage and encourage them to play an active role in economic revitalisation of their territories through certain actions that promote georourism, education and other nature-friendly activities. Regular meetings and common activities of the members of the Network help to share best-practice approaches and experiences and to develop geotourism marketing and geoconservation strategies. Up-to-date, the Network consists of 25 members from 9 different European countries.

Psiloritis Natural Park, the managing authority of the geopark in the broad Psiloritis area, has been established by AKOMM-"Psiloritis" S.A., the local development association and has been scientifically supported by the Natural History Museum of Crete and other external scientists. One of the main targets of the Park is the promotion of the unique natural environment developing actions for alternative tourism and geotourism. It was necessary, thus, to assess the value of the natural abiotic environment of the park as living environment has been extensively studied either under the Natura 2000 initiative or other local studies, in order to develop policies and strategies for conservation and economic development. These efforts are presented in this article.

2. METHODOLOGY

The question that arose decades ago; why should we conserve biodiversity and nature in general, is the starting point to discuss the possible or real value of geodiversity. Definition of this value in a territory assigns the degree and importance of geodiversity as an economic resource. Although the value of nature or the rationale of nature conservation was studied by many organisations and authors (see [5], [6]), the way to value geodiversity has recently been outlined. Several approaches have been presented in the literature, however the most comprehensive and expanded one [1] classifies this value into six groups; intrinsic or existent; cultural; aesthetic; economic; functional; and research or educational one.

Intrinsic value refers to the ethic belief that some things have a value only because of their existence in a limited planet and this is the hardest value to describe in any case since it refers to ethical and philosophical concepts. *Cultural* value describes the value placed by local society on some elements of abiotic environment due to its social or community significance. This can refer to folklore or mythology (Greek mythology gives many examples), to archaeology or history (none more representative than the use of caves by mankind), to spiritual ethics and even to the sense of place that describes the bonds between people and their physical surroundings. *Aesthetic* value refers simply to the visual or any other appeal of physical environment, including natural beauty, harmony of natural components, rarity, breathtaking sceneries, outstanding views, hardly approached places etc. This is one of the most commonly recognized value of abiotic environment by organisations and society. *Economic* value, also a very tangible concept for abiotic nature, refering to the economic value of many geological materials that may include mineral fuels, industrial, precious and construction minerals, fossils or even soil and landscape resources. *Functional* value is a new, but very important concept for nature conservation that already has been adopted by many EU regulations and directives (see EU directive 60/2000 for water policy). It refers to the fact that soils, sediments landforms and rocks have a functional role in environmental systems. Geodiveristy has thus both utilitarian value for human society (use of bedrock, rocks etc. for many purposes) and functional value in providing the essential substrates, habitats and abiotic processes, that maintain physical and ecological systems. *Research* or *educational* value simply describes the value of certain areas for the development of science and use for educational purposes.

Recognition of the value of geodiversity is internationally restricted mainly to the economic and aesthetic components and in rare cases to the cultural one too [1]. Examples can be found in Yellowstone and Grand Canyon in USA, Uluru red rocks in Australia, Messel Pit Fossil site in Germany, Petra temple in Jordan or Meteora in Greece, which are assigned or nominated as UNESCO World Heritage sites, Earth Biosphere Reserves, National Parks etc. In Greece national legislation is very poor in recognising the value of abiotic nature [7]. Only a few examples can be given for the protection or designation of geodiversity like Samaria Gorge, Meteora and several caves, but these are related to either natural or cultural components. Exception (existing in order

just to confirm the rule) is the Lesvos Petrified Forest, the only geological site in Greece protected by law.

It is thus essential for any territory or society to evaluate its geodiversity in order to proceed to nature conservation and management. Existing practices apply this evaluation at the scale of geosites or geotops [3, 8], where geotops refer to distinct parts of the geosphere of outstanding geological and geomorphological interest [9]. Geotops can thus represent quite different in size and character earth components, such as rock outcrops, fossil sites, caves, river basins or landscapes.

The crucial point however for a wise conservation is to evaluate together geo- and bio-diversity under a holistic approach that could also encompass human environment. In addition, it is necessary that conservation should enable development activities and actions for the benefit of the society, instead of being trapped under a rigorous "protection" status, which may cause several other environmental and developmental problems [10]. It is exactly on this point that the European Geoparks Network appears to be so innovative supporting human and developmental activities simultaneously with conservation measures within each geopark. Managing authorities are encouraged to develop holistic strategies for the promotion and protection of natural and cultural heritage in order to achieve a true territorial economic development.

The most important geotops of Psiloritis Natural Park were evaluated under the perspectives of the European Geoparks Network and the aforementioned issues were assigned according to their value in different categories. The importance of each individual geotop was then characterised as international, national, regional, or local; depending on their rarity, scientific, functional and aesthetic appeal.

3. ASSESSMENT OF PSILORITIS GEOTOPS

Several categories of geotops occur in Psiloritis Natural Park including landscape sceneries, functional landforms, fossils sites, water appearances, rock types, structures and individual outcrops [11]. Each geotop may be consisting of more than one geospheric component. The geotops were mapped and a database was created during the implementation of an early management plan of the Geopark. Evaluation of the geotops took place following the standards of international organisations [3] or other national efforts [8]. Figure 1 presents the location of the most important geotops of the wide Psiloritis Area, whereas Table 1 summarises the assessment of the value and importance of the each geotop.

For each geotop the most important value or values are described in a priority order. Twelve geotops are absolutely of high aesthetic value, nine geotops have important research or educational value, whereas four others are of high functional value for ecosystems or humans and four of significant cultural value related to the archaeology or history of the area. Economic value related to water presence or utilitarian use has been identified for some geotops. The intrinsic value is not reported for all geotops, as it is still very hard to evaluate.

According to their value the geotops were then evaluated for their importance in more than one categories. Three geotops are of international importance: the Idaion andro cave as the place where Zeus grew-up, according to Greek mythology, the Sisses-Aloides session for the complete presence of the Plattenkalk series and the implications to the development of Tethys as well as the Agios Fanourios fault as a unique exposure of the Cretan detachment. Four other geotops are of national importance: the Fodele fossil site where the oldest and most well-preserved fossils of

Crete occur in high metamorphosed rocks, the Bali outcrop for the very old fossils of trilobites and crinoids, the Kamares cave with the unique Minoan pottery style, and the Gonies section where all nappes of Crete occur within a small outcrop. Eleven geotops were identified as of regional importance and the rest only for local.

TABLE 1. Assessment of Psiloritis geotops.
Abbreviations refer to: *LS*, landscape scenery; *FL*, functional landform; *RT*, rock type; *FS*, fossil site; *RT*, rock type; *ST*, structure; *WA*, water appearance; *IO*, individual outcrop; *Ae*, aesthetic; *Cu*, cultural; *Ec*, economic; *Re*, research-educational; *Fu*, functional; *I*, international; *N*, national; *R*, regional; *L*, local; *Edu*, education and; *Tour*, tourism-related.

Geotop	***Category***	***Value***	***Importance***	***Use***
Talea Ori Sequence				
A.1 Fodele fossil site	*FS*	*Re*	*N*	*Edu*
A.2 Bali outcrop	*FS, LS*	*Re, Ae*	*N*	*Edu, Tour*
A.3 Sisses – Aloides section	*LS, RT, WA*	*Ae, Re*	*I*	*Tour, Edu*
A.4 Vossakos folds	*ST, RT*	*Re, Ae*	*R*	*Tour, Edu*
A.5 Bali submarine springs	*WA, LS*	*Ae*	*R*	*Tour*
Psiloritis Karstic Landscape				
B.1 Nida plateau	*FL, LS, RT*	*Fu, Ae, Ec, Cu*	*R*	*Tour, Edu*
B.2 Idaion Andro cave	*ST, FL*	*Cu, Ae, Ec*	*I*	*Tour, Edu*
B.3 Petradolakia landscape	*LS, FL, ST*	*Fu, Ae, Re*	*L*	*Tour, Edu*
B.4 Tafkoura pothole	*ST, FL*	*Fu, Ae*	*R*	*Tour*
B.5 Agios Fanourios fault	*ST, LS, WA*	*Re, Ae, Cu*	*I*	*Edu, Tour*
B.6 Mitata	*FL*	*Cu, Ae, Ec*	*R*	*Tour, Edu*
Mountain to Basin Park				
C.1 Almiros gorge	*ST, FL, LS*	*Ae, Fu*	*L*	*Tour, Edu*
C.2 Almiros spring	*WA, FL*	*Ae, Fu, Re*	*R*	*Tour, Edu*
C.3 Voulismeno Aloni doline	*ST, LS*	*Ae*	*L*	*Tour*
C.4 Gonies gorge	*ST, LS, FL, WA*	*Ae, Fu*	*L*	*Tour*
C.5 Kroussonas area	*LS, ST*	*Ae, Re*	*L*	*Tour, Edu*
C.6 Gorgolaini outcrop	*ST, LS*	*Re, Ae*	*L*	*Tour, Edu*
C.7 Grandma's pies	*IO, LS*	*Ae, Cu*	*L*	*Tour*
C.8 Agia Varvara Evaporites	*RT*	*Re*	*R*	*Edu, Tour*
C.9 Rouvas Natural Museum		*Re*	*L*	*Edu, Tour*
C.10 Zaros spring-gorge	*WA, LS, FL*	*Ae, Ec, Fu*	*R*	*Tour*
Speleopark				
D.1 Sfentoni cave	*ST, FL*	*Ae, Ec, Fu, Cu*	*R*	*Tour, Edu*
D.2 Kamares cave	*ST, LS*	*Cu, Ae*	*N*	*Tour*
D.3 Melidoni cave	*ST, LS*	*Cu, Ae*	*R*	*Tour*
D.4 Hainospilios cave	*ST, FL, WA*	*Ae, Fu*	*L*	*Tour, Edu*
D.5 Koritsi cave	*ST, WA*	*Ae, Ec*	*L*	*Tour*
Individual Sites				
E.1 Gonies nappes	*LS, ST, RT*	*Re, Ae*	*N*	*Edu, Tour*
E.2 Chonos Nature sculptures	*IO, ST*	*Ae*	*L*	*Tour, Edu*
E.3 Margarites gorges	*FL, LS, ST*	*Fu, Ae*	*L*	*Tour*
E.4 Damasta detachment fault	*ST*	*Re*	*R*	*Edu*

The results of this evaluation were crucial for the planning and the development of the Psiloritis Natural Park. Certain activities and actions were planned on the basis of this evaluation, as well as to the connections that could be established and interpreted in any case with nearby elements of living, cultural and human environment. This led finally to the preparation and implementation of

the first management plan of the geopark and to the design and proposal of certain policies for local economic development of the wide Psiloritis area.

4. ACTIVITIES FOR ECONOMIC DEVELOPMENT

Following the evaluation of geotops, their spatial occurrence and the recognition of possible connections with other important elements of the area, the Park has been subdivided into thematic sub-parks that can promote and interpret important issues of the earth history of the area. These subparks are necessary for managing purposes too as the park covers a huge area (Figure 1). Thus, *Psiloritis Karstik Landscape* comprises of structures and features related to the uplift of the mountains, the water cycle and the karstik weathering. *Talea Ori Stratigraphic sequence* offers a journey of 250 million years to the early geological history of the island. The whole statigraphic sequence of the Plattenkalk series is only exposed in the area in an inverted form. Rock types, folds and fossils comprise the geotops of this sub-park**.** The *Basin to Range Park* interprets the development of the Neogene basins of Crete in respect to the high mountains. *SpeleoPark* will be established on the Psiloritis Mountain as an individual park in which the main aspects of speleology will be properly demonstrated.

FIGURE 2. Implementation of an educational project on functional relationships of landscape, ecosystems, and endemism in dolines of Psiloritis Mountains.

The holistic approach of nature and geoheritage promotion and conservation suggested by the European Geoparks Network has been adapted for the development of the Psiloritis Natural Park. The main pylons of development became thus the establishment of alternative tourism and educational activities. Under this frame the recognition of the Park as an important value for the territory was set to be the most important target that could enforce local people's awareness and respect to the geological heritage. Sustainable development of the Park is thus based on the education and alternative tourism (geo-tourism, agro-tourism, eco-tourism). Educational activities are related with the development of special courses and field trips addressed to universities and groups with special interests (speleologists, botanists, tourist guides etc.), as well as with geology field trips, school projects (Figure 2), entertainment events and other public activities.

Designing the strategy for tourism development in the area of Psiloritis took in account the important fact that till our days, earth and natural heritage are of quite low importance for the tourism-related companies which seem to address only archaeology-related sites. Hence, the new approach for the promotion and protection of the earth heritage in the area had to be related with

its cultural and historical heritage too [11]. Tradition, customs and songs are inspired by the landscape and environment at the same way that history and civilisation were based on the natural wealth. The Park can be an attractive reason for visitors who want to discover culture, traditions and the unique environment of the mountainous inland of Crete. Establishment of such tourism will support many of the Leader-related private initiatives that have been undertaken in the area and will improve many of the living parameters of the area.

FIGURE 3. The new visitor centre in the entrance of Anogia village.

For each sub-park we plan to develop certain infrastructures in order to serve both the promotion of earth heritage and visitors needs for general information. Info centres associated with walking paths or car-routes, info-panels and signs will welcome visitors in the main towns nearby the sub-parks, informing for the individual features and facilities of the area, suggesting short and long trips around, promoting the natural and cultural beauties of the territory and spreading information for the Natural Park itself and the European Geoparks Network. Up-to-date, only Gergeri Natural History Museum and Anogia Visitors Centre (Figure 3), partially serve this target. However, several proposals for funding such actions have been submitted to European programs. Complementary to the aforementioned efforts three new tourist offices for promotion of alternative tourism were funded by the LEADER+ initiative and have started to operate in Gergeri, Zaros and Amari areas this year.

Certain actions for promotion and enhancement of the park have been designed in collaboration with the European Geoparks Network. Publication of leaflets, booklets, posters and recently of a newsletter is funded by local or inter-regional EU projects such as LEADER+ or INTERREG IIIc. Serving the same need, other social activities such as meetings, seminars, fests, talks in schools and villages, and the annual European Geoparks week take place every year in the area. Very important for spreading the “know-how” and the experiences gained by the participation in the European Geoparks Network to the staff of the Park and the public, are the exchanging projects and thematic workshops that are funded by INTERREG IIIc project. This year an exchange of personnel working in the caves of the Park (Sfentoni, Melidoni) visited the Marble Arch Caves Geopark in Northern Ireland and two workshops one for local handicrafts and products and one for alternative tourism within the Geoparks Framework took place in Margarites and Zaros villages, respectively.

In addition, it has been scheduled a revision of the existing management plan, a campaign for the implementation of special management plans in the areas of the Geopark that participate to the

Nature 2000 network and the development of other necessary infrastructures (museums, thematic trails, libraries, data-bases etc.).

5. CONCLUSIONS

As it was aforementioned, geodiversity is poorly recognised and protected by the national legislation. Ethics and social behaviours add more threats to abiotic environment than the living one. Hence, protection of the geodiversity in the Psiloritis Natural Park is a very difficult task for the managing authority of the park. The only possibility for the conservation of the geotops under the given status is to reveal the economic value that these could have for the local communities.

The holistic approach of the nature conservation and management of the European Geoparks offered practices, methodologies, strategies and funds to implement environmental-friendly development activities. These are mainly focused on the development of certain types of alternative tourism, such as geo-tourism, agro-tourism and eco-tourism that could attract a portion of the seasonal tourists of Crete. Furthermore, thematic-related tourism may expand the touristic season, which now comprises only by the summer months. In addition, educational activities support local educational authorities and initiatives increasing visitors in the Psiloritis Natural Park and informing them of the value of nature.

The model for nature conservation and management in Psiloritis Natural Park can apply as an alternative proposal to the previously implemented economic development of Crete, and contribute to the true development of its inland.

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