When the landscape is just the beginning

GEOPARQUE GRANADA

The Geopark of Granada is a territory with a geological heritage of exceptional value, on which a sustainable development strategy is configured, which represents one of the most important challenges and, in turn, a future opportunity for the rural environment of a wide area of our province.

It is the result of joint work and collaboration between public and scientific institutions and local social and economic actors, and an example of how to launch a process of continuous progress in some of the counties that most need it, in order to obtain a long-term benefit to citizens.

These lands, arid and beautiful, reflect the evolution of the landscape over millions of years that has been written in stone and that allows us to understand and enjoy one of the most unique environments in the province of Granada.

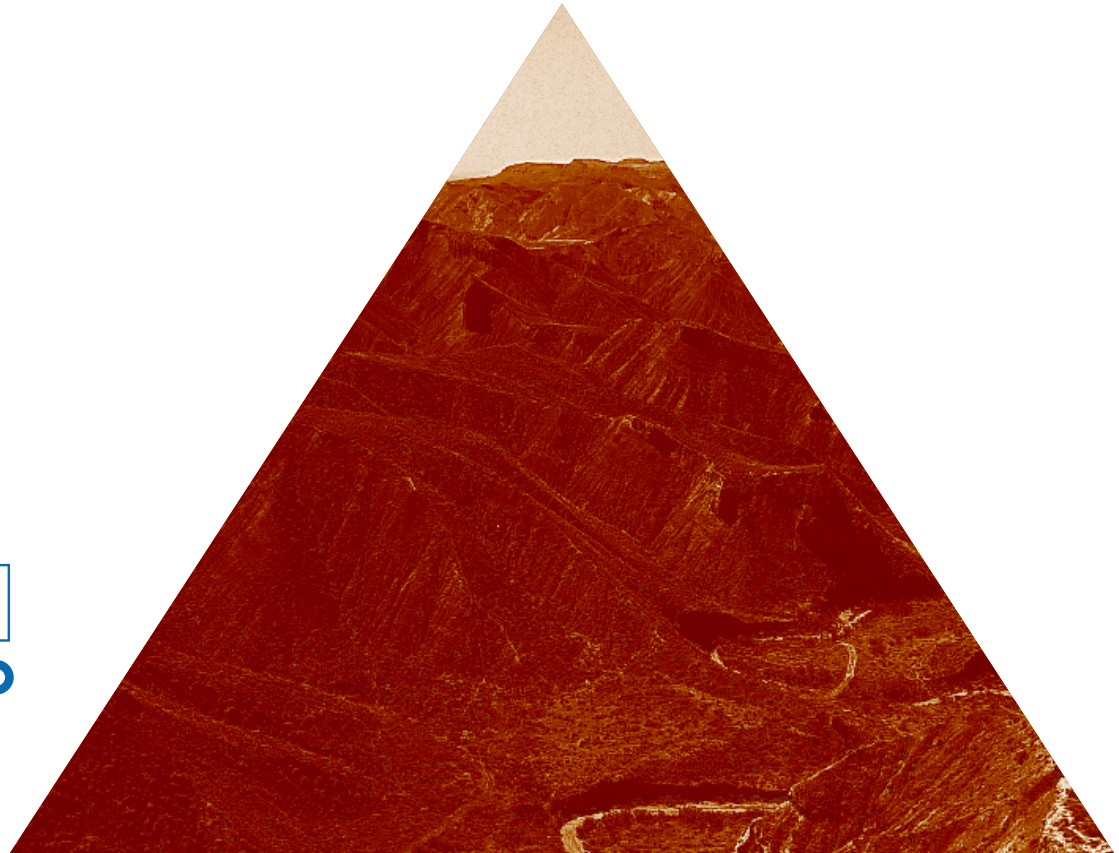
The recognition, by UNESCO, of this unique place as a member of the Global Network of Geoparks is a privilege, but it also requires a strong commitment on the part of all to preserve it and maintain its importance at the international level. This document aims to be a general tour of our Geopark: its characteristics, its main resources, its geological history and the different civilizations that, over the centuries, have settled in this environment, leaving their mark to this day.

With this publication we want to bring the Geopark of Granada closer to its visitors and generate pride of belonging among the local population, who fight every day to remain in the territory, strengthening the future of the younger generations. For this reason, we invite readers to immerse themselves in a journey through time, to go through the history and heritage, not only geological, but also natural and cultural, of this spectacular corner of Andalusia and of those who have inhabited and guarded it for centuries, making it possible for it to become a different and welcoming tourist destination.

A unique territory in the world, where the landscape is only the beginning.

José Entrena Ávila
President of Granada Geopark

There is still lots
for you to discover!



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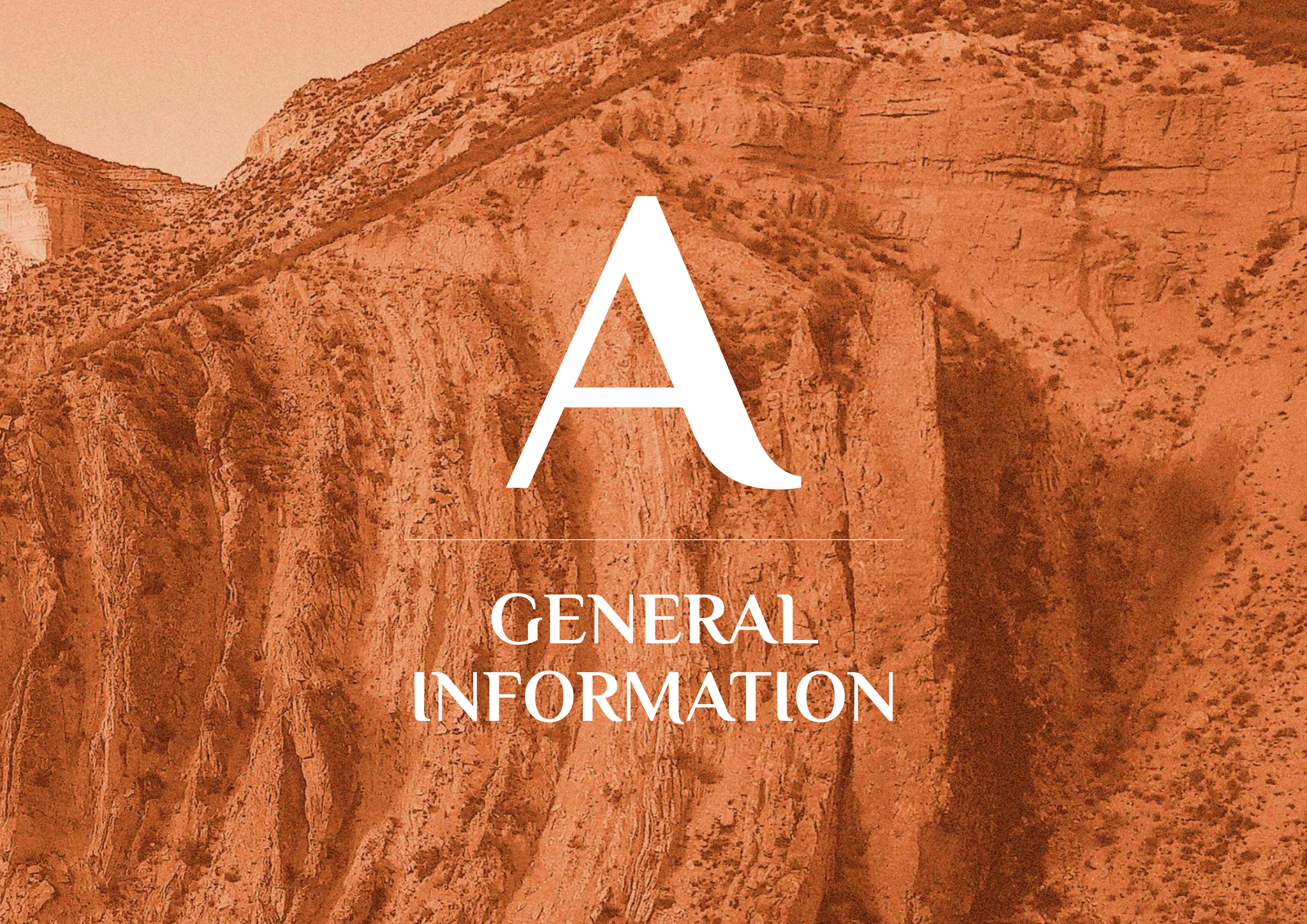


A

GENERAL INFORMATION

A1. WHAT IS A GEOPARK?

A Geopark is a coming together of organisations and members of the public around a territory of exceptional geological features in world terms, which endow its natural and cultural landscape, tourism, cuisine, and agrifood and craft products with a distinctive quality and uniqueness, enabling them to become a means of sustainable local development. A Geopark **is not a protection status, nor does it aim to be, and does not impose rules of use,** but it does encourage the conservation of its heritage.

They are areas of high scientific importance, distinctiveness and natural beauty, whose object is to highlight the endogenous resources of a territory in order to enhance the quality of life of its inhabitants, diversifying economic activity and thus helping to curb the depopulation processes that threaten these rural areas through a development strategy of their own based on tourism. They are also living laboratories and tools for communicating geo-scientific knowledge to the public through their museums, interpretation centres, education programmes, itineraries and guided visits to the most important places of interest.

Geoparks are entities recognised by UNESCO, within the framework of its International Earth Sciences and Geoparks Programme. All Geoparks recognised in this way are members of the **Global Geoparks Network** – a non-profit association working on a global scale – which provides a platform for cooperation and exchange between territories, experts and professionals in geological heritage matters. Under the umbrella of UNESCO and through collaboration between members of the network, locally important geological sites gain worldwide recognition and benefit from exchange of knowledge and experience with other Geoparks.

The geopark concept includes various issues, all of which are important to attain the objectives of social and economic development of a territory:

- **Education.** The involvement and participation of the educational community is necessary to learn to know, value and respect our heritage, through the production of teaching materials for schools where the youngest are made aware of the importance of the values of their environment and its rational use, creating a feeling of pride and identity in the territory.

- **Research and dissemination of scientific knowledge** to discover, study and preserve geological heritage and geodiversity, but also to make contributions in the field of education and popularisation of this knowledge. This contributes to enhancing the ability to conserve existing resources, as well as reinforcing discourse when constructing the geotourist interpretation of the environment. A geopark must also use knowledge of its heritage to generate awareness of the keys to living on a dynamic and constantly changing planet and thereby increase sensitisation.

- **Promotion of natural and cultural heritage** (both tangible and intangible), taking account of its geology, the environment, landscape, culture, traditions, and, in short, heritage in general. This plays an active role in the economic revitalisation of the territory and the quality of life of its inhabitants. Promotion of geotourism, as a sustainable type of ecotourism, provides resources for local companies offering tourism products and services.

- **Coordination, participation and networking.** The active participation and cooperation of the local population in formulating and implementing management plans for their area is crucial. Social and business support and the participation of administrative authorities and other local agents are essential when it comes to setting in motion actions that will economically energise the territory, protect the resources and the landscape they live in, and preserve its cultural identity. Similarly, networking with other Geoparks provides collaboration and learning when it comes to improving management and exchanging good practices and innovative initiatives.

A Geopark, therefore, is not only geology; it is also ecology and culture and is managed with a holistic/comprehensive concept of conservation, education and sustainable territorial development, taking account of the conservation of resources, the needs of the local community and their cultural identity.

Visiting a Geopark is something more than enjoying a landscape; it is visiting a land that is valued and appreciated by its own society and is proud to show and preserve its heritage. In addition, it enables us not only to understand the processes that have taken place throughout the history of the Earth, but also to explain current challenges such as climate change, natural hazards and the importance of sustainable use of the planet's resources.

> **A Geopark is a holistic/comprehensive concept of conservation, education and sustainable territorial development that takes account of the conservation of resources, the needs of the local community and their cultural identity.**

A2. THE GRANADA GEOPARK

A2.1. A thousand and one reasons to visit

The Granada Geopark represents one of the landscapes least altered by human action within the continent of Europe. Nevertheless, its geological features have marked the cultural development of its inhabitants since antiquity. Geology, geomorphology, prehistory and culture merge into an inseparable whole, in a space with some of the oldest human remains in Europe.

This territory is a living laboratory, where the geological processes that have led to the morphology and the spectacular landscape we know today, formed by thousands of gullies and ravines of different colours occupying the central and geologically most important part of this area, are investigated, studied and interpreted for visitors and for the local population.

The semiarid nature of the territory, with sparse vegetation on the sides of its valleys, lends itself to the observation and study of its exceptional geology.

Moreover, as a result of the deep erosion and downcutting of its rivers, various geological periods have emerged and been revealed, making it possible to interpret them. Visitors can enjoy seeing sediments, rocks, fossils, strata, faults and folds, and thereby better understand the history of the Earth.

This Quaternary landscape, unlike other Quaternary areas of the planet, is very young. It was formed only half a million years ago. Five million years ago almost all the present landscape was underwater, a large endorheic lake (with no outlet to the sea), fed by the river basins. It was a large plate full of water to the brim, perfect terrain for the deposition of sediments in horizontal layers, allowing the substrate to be read perfectly.

When part of the rim – to the west – allowed a natural outflow of water, the lake emptied and the deeply incised landscapes that have come down to our own day were gradually shaped. These are the **gullies or badlands,** one of the hallmarks of the Geopark which, thanks to their recent formation (only 500,000 years ago), appear to the visitor's eye as freshly made.

The Granada Geopark contains more than 70 sites of geological interest, with several of international significance, notably important folds and faults, some of which are still active and which help us to understand the configuration of the Baetic System.

There are also important structures such as the **seismites,** which constitute outcrops that are unique worldwide. Like a gigantic seismogram drawn on the rocks, these structures show us ancient earthquakes which tell us a history going back more than 250 million years. There are also the **pillow lavas** and a large variety of resources of unquestionable scientific, educational and/or tourist interest.

Mention should be made of its main viewpoints, which offer us a visual compendium of the various geological and geomorphological features. They enable us to enjoy the key values that make this remarkable territory a Geopark.

Overall, the landscape of the Granada Geopark is reminiscent of some famous and much visited spots in other continents on the planet. Outstanding among its geological resources are also **some of the most important human remains in Europe, more than 1 million years old (such as Orce Man),** as well as an important group of palaeontological deposits of continental vertebrates from the European Quaternary, with very well preserved fossils of large mammals, found in more than 150 identified locations.

But the Granada Geopark is not just about geology. As well as its magnificent landscape, it also possesses many other assets that are worth getting to know, visiting and preserving.

This territory has valuable steppe ecosystems, which host a **rich biodiversity,** with many endemic species of both fauna and flora.

It also conceals numerous traces of human presence, representing all the cultures that settled and left their mark in the area, from prehistoric times to our own day. The rich and varied archaeological remains bear witness to this, helping us to get to know the past and the legacy of all the civilisations that have left evidence of their presence in these lands. This constitutes an **important historical, artistic and cultural heritage** that must be made known and highlighted.

It has a unique cave-dwelling landscape, a magnificent example of that relationship between people and geology, and is characterised by an original type of traditional dwelling excavated in the sedimentary rocks of the Geopark: **cave houses,** which have been used since medieval times.

These are traditional bioclimatic houses, which maintain a constant temperature of around 18 °C throughout the year. Nowadays they constitute one of the territory's most important tourist attractions, with all kinds of facilities (accommodation, restaurants, interpretation centres, wineries, equestrian centres and craft workshops) located in these remarkable structures.

Intangible heritage is another important asset of this Geopark. Some traditional local festivities and celebrations such as ***Cascamorras*** (declared a festival of International Tourist Interest) or ***Moors and Christians*** and ***Holy Week*** are also part of the cultural heritage of the area and are, in addition, a great tourist attraction.

In this connection, the recovery and practice of old trades and crafts with a long tradition in the territory, such as **ceramics, esparto (local vegetation), woodworking, craft bakery and cheesemaking,** are some of the workshops offered to schoolchildren and visitors for their enjoyment and learning.

The rich and healthy food typical of the area is undoubtedly another important attraction of this Geopark, offering excellent local agrifood products. Some of these quality products have a protected designation of origin *(Segureño* lamb, olive oil, wines and honey).

The Granada Geopark has a network of **35 visitor centres** distributed all over the territory (museums, interpretation centres, scientific facilities, tourist offices, etc.) which show and promote all this highly varied heritage (palaeontological, archaeological, historical, cultural, ethnographic, and so on). They all work in a coordinated way and provide information on the Geopark and on the other centres in the network.

In addition, this territory offers the possibility of practising a wide range of **open-air activities,** in direct contact with nature and with low impact on it, such as astrotourism (excellent sky conditions for observing stars and planets), ecotourism, geotourism and scientific tourism, rural tourism, adventure tourism, hiking, climbing, cycling, riding, canoeing, birdwatching, ballooning, environmental education, and so on.

All these activities are linked to geological elements and offered by local companies.

For visitors, the Granada Geopark is a world to discover and enjoy, with a very large and varied range of attractions: unique landscapes, vestiges of our history, evolution of the land, quality products, traditions and local hospitality, which make the territory a prime tourist and educational product.

For the local population, it offers a reason to be proud of their natural and cultural heritage, as well as of their own identity, and represents a great opportunity for sustainable development, creating employment opportunities, by taking advantage of a hitherto unused resource.

After millions of years, this territory is ready for scientific research on its resources, the development of tourist and educational activities and enjoyment and knowledge for society as a whole.

A2.2. Location

The Granada Geopark (GG) is located in the southeast of Spain, specifically in the north of the **province of Granada,** within the region of Andalusia. Figs. A. 1 and A. 2

It has a total surface area of 4,722 km2. This area represents 37.36% of the total territory of the province of Granada, extending more than 100 km lengthways (SW-NE) and more than 40 km across (NW-SE).

Fig. A.1 | Location map of the GG

	EAST	WEST
LONGITUDE	2°16'51,74"W	3°20'41,33"W
	SOUTH	NORTH
LATITUDE	37°15'42,48"N	37°51'44,65"N
ALTITUDE	534,2 m	1490,2 m

Fig. A.2 | Tables of coordinates of the GG

A2.3. Brief description of the Geopark's geographical, physical and human features

The territory of the Geopark largely coincides with what are known geographically as the Guadix and Baza depressions, or from the geological point of view with the Guadix-Baza Basin, as well as a large part of the mountains that shape them. The most northerly part, with the Huéscar and La Puebla mountain ranges, contains the main headwaters of the Guadiana Menor drainage basin, which includes the river valleys that provide access, further downstream and mainly in continental Pliocene-Quaternary sediments of that basin, to most of the sites of geological interest that make up this Geopark. Fig. A. 3

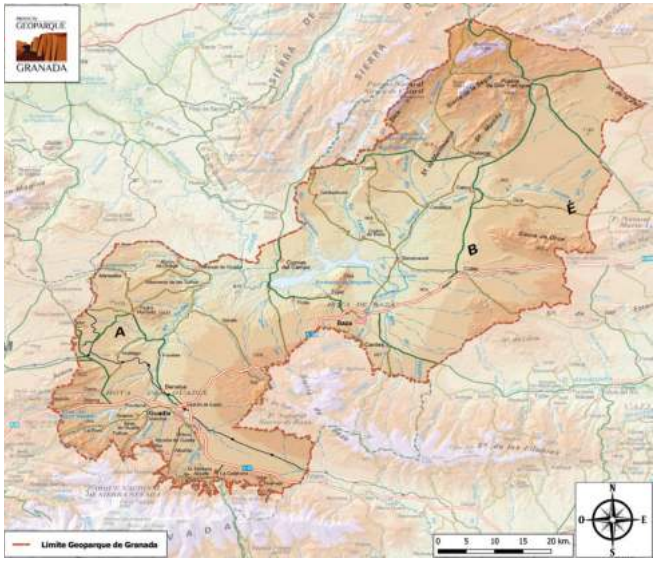


Fig. A.3| Delimitation map of the Granada Geopark

A2.3.1. Territory and physical environment

The Granada Geopark is located in the **central sector of the Baetic System** (SE Spain); approximately 15% of its area is occupied by part of the mountain ranges that form the borders of the Geopark, with some of the highest mountains in the Iberian Peninsula (Prebaetic System and Sierra de la Sagra [2,381 m], Sierra Mágina [2,187 m], Sierra de Arana-Huétor [1,940 m], Sierra Nevada [3,484 m], Sierra de Baza-Filabres [2,271 m], Sierra de las Estancias-Cúllar [1,471 m], Sierra de Orce-María [1,612 m]).

All these mountains represent most of the space of the Granada Geopark. This space, which has traditionally been subdivided into a western half (Hoya de Guadix [Guadix depression]) and an eastern half (Hoya de Baza [Baza depression]), actually forms a **single intramontane depression.**

The connection between these mountains and the depression is articulated through a plain (glacis) – which occupies 60% of its area – with a very gentle slope and altitudes of between 1,150 m at the edge of the depression and 900 m within it, where it is still preserved (García Tortosa et al., 2007, 2011). Fig. A. 4

In the central part, between 900 m and 550 m above sea level, the most remarkable landscapes in the Geopark area are found, formed by the various channels that drain the depression cutting into the glacis. This hydrographic network forms an **arid and very uneven landscape,** of which the outstanding feature is the gullies or badlands, which include canyons up to 250 m deep, and the fluvial terraces of the principal rivers, which form alluvial plains known in the region as vegas (De la Cruz Pardo et al., 2010). These formations represent around 25% of the area here. Fig. A. 5 and A. 6

The Geopark comprises **46 municipalities,** belonging to 4 districts of the province of Granada: Baza, Guadix, Huéscar and Los Montes, apart from the space included in national parks or national parkland, since those entities have their own development plans and managing bodies.

Fig. A.4| Panoramic view of the expanse of badlands characteristic of the Granada Geopark *@Alberto Tauste*

Fig. A.5| Riparian vegetation dominates the landscape alongside the river valleys (River Guadiana Menor, Hoya de Guadix)
@José Antonio Garrido

Fig. A.6| Negratín Reservoir with the Cerro de Jabalcón in the background
@Alberto Tauste

A2.3.2. Population and demographic change

The population of the municipalities that make up the Geopark amounts to a total of just over 100,000 people. The cities of Guadix and Baza account for more than 40% of the inhabitants of the territory. The rest of the population is distributed in small towns whose population, in many cases, does not exceed 2,000.

It is therefore a **predominantly rural setting** where 93% of the population live in areas with less than 50 people per square kilometre and the population centres are embedded in a spectacular arid steppe landscape in northern Granada. Fig. A. 6

The demographic structure is characterised by an ageing population above the provincial and regional mean and a continuously declining birth rate. It is important to highlight the feminisation of the territory, especially in the older age groups. Fig. A. 7

With a tendency towards depopulation, the area is suffering an unremitting process of loss of inhabitants in the territory. The emigration of young people and women seeking better opportunities for education and employment elsewhere is the main factor. In recent years, however, this trend has begun to slow down with the arrival of foreigners taking up residence in the area.

According to the demographic data, there was a reduction of 15.3% in the population of the territory in the period from 1999 to 2019, in contrast to the results for the province and for the Andalusian region, where the population increased during the same period.

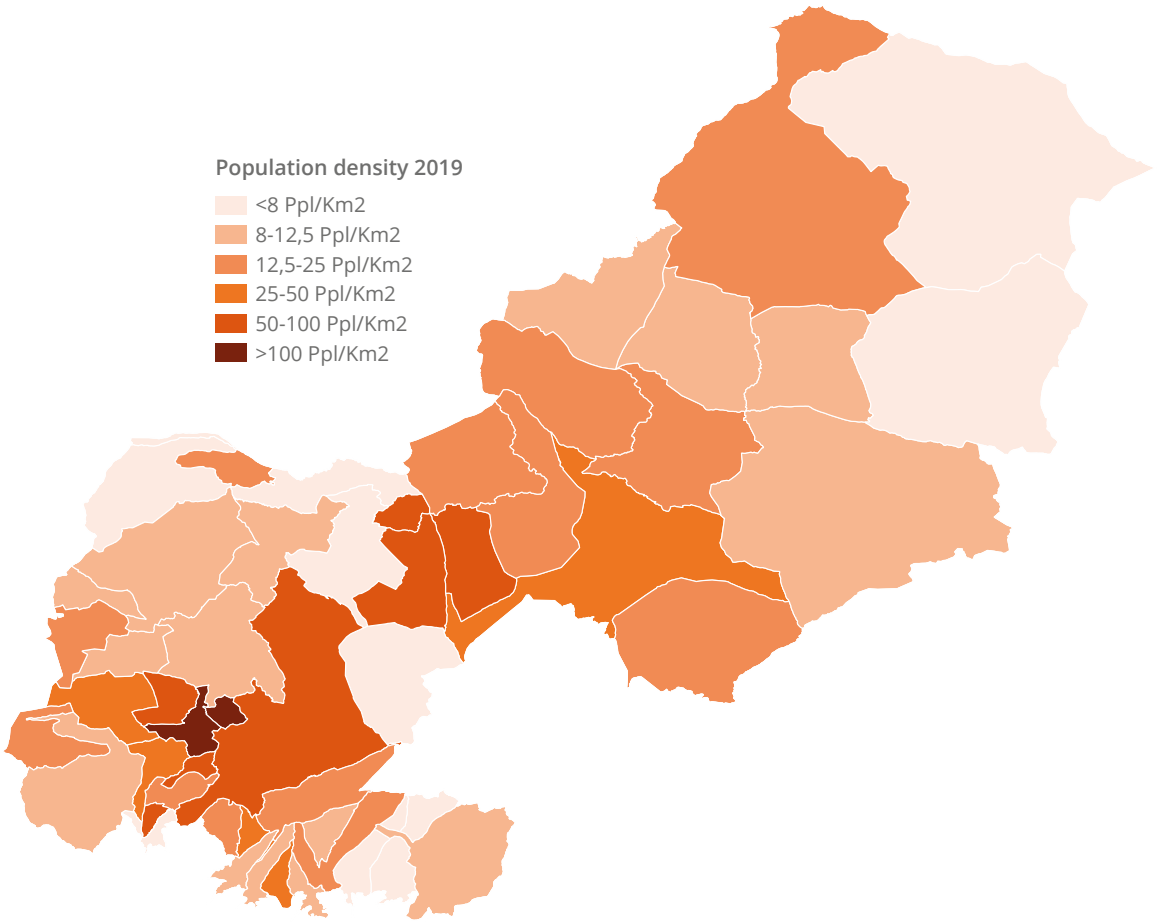


Fig. A.7| Map of the population density of each of the municipalities affected by the delimitation of the Geopark Population density 2019

	GEOPARK	PROVINCE GRANADA	REGION ANDALUSIA	SPAIN
DENSITY (PEOPLE/KM2)	17.47	72,41	96,08	93,53
POPULATION CHANGE (1999–2019)	-15,30 %	+11,11%	+13,14%	+14,48%
POPULATION AGED < 15 YEARS (%)	17.47	72,41	96,08	93,53
POPULATION AGED > 15 YEARS (%)	-15,30 %	+11,11%	+13,14%	+14,48%

Fig. A.8| Comparative demographic data 2019
@National Institute of Statistics/Provincial Council of Granada

A2.3.3. Economic activity

The territory depends predominantly on **dry or rainfed farming** (15% of the population are professionally engaged in agriculture), focusing on growing **cereals, legumes, vines, olives and almonds.** This activity accounts for most of the surface area and the number of people working in the Geopark. (See section D.6. *Sustainable development in the Granada Geopark).*

With regard to livestock, the predominant activity is **extensive rearing of sheep** of the local Segureño breed, perfectly adapted to the harsh conditions of the area. There are several local products covered by **Designation of Origin (DO) and Protected Geographical Indication (PGI) status.** Fig. A. 9

Among craft activities **ceramics** are prominent, especially, in Guadix and Purullena. Equally important are **woodworking, esparto weaving and production of cured meats.**

Mining has also been historically important in this area, with the exploitation of the metalliferous seams of the Marquisate of Zenete since Roman times.

Commercial activity and **tourism** are sectors with great potential that are taking advantage of the exceptional nature of the territory and the wide range of options offered by ecotourism and sustainable cultural tourism. For the period between 2012 and 2019, Granada's Tourism Observatory recorded a total of 1,131,296 visitors, **with an increase of 74.52%** in people attracted mainly by the archaeological and palaeontological resources, nature, landscape and the cultural legacy of the various civilisations that have populated the territory of the Geopark.

Fig. A.9| Products of the territory covered by Designation of Origin and Protected Geographical Indication.
Look for these labels on our local products!

A2.4. Organisation and operation

A2.4.1. Background

The Granada Geopark is a supra-municipal local development initiative based on the exceptional value of the geological heritage and the cultural and natural resources of the area and carried out with a methodology of cooperation and participation with all the actors in the local population. It is a project on which the territory has been working since 2002 and has been gaining institutional, economic and social support since then.

This process culminated in an agreement signed on 7 November 2017 and a subsequent addendum on 31 October 2018, by which the main entities representing the territory undertook to create the Granada Geopark.

A2.4.2. Management structure

Responsibility for the management, coordination and monitoring of the activities planned in the Granada Geopark lies with the **Coordination Committee** (Fig. A.10), made up of the representatives of each of the entities (institutional, socioeconomic and scientific) that are signatories to the Geopark's foundation protocol. The *Instituto Geológico y Minero de España* (IGME: Geological and Mining Institute of Spain) is the advisory body of the Public Administration of the State in matters of Earth Sciences and is also included in the above-mentioned Committee.

The organisation and coordination of the territorial agents has been accomplished by creating the **Working Groups** representing the areas affecting the Geopark (Scientific, Socioeconomic and Institutional). Fig. A.11

The Coordination Committee is chaired by the President of the Provincial Council *(Diputación)* of Granada.

In addition, the Provincial Council of Granada takes on the direction and technical secretariat of the Geopark.

The functions of the Coordination Committee of the Granada Geopark are:

- **To represent the Geopark on a participatory basis,** disseminating the exceptional international value of the geodiversity present in the territory and of the rest of its valuable heritage.
- **To supervise the implementation of the agreed initiatives** to achieve the established objectives and goals. For this purpose, the "Strategy of the Granada Geopark" has been designed, incorporating the actions to be carried out by the signatory entities according to their own lines of action and financial frameworks, through complementarity and synergies between the planned actions.
- **To resolve the different interpretations** that may arise while the protocol in in force.

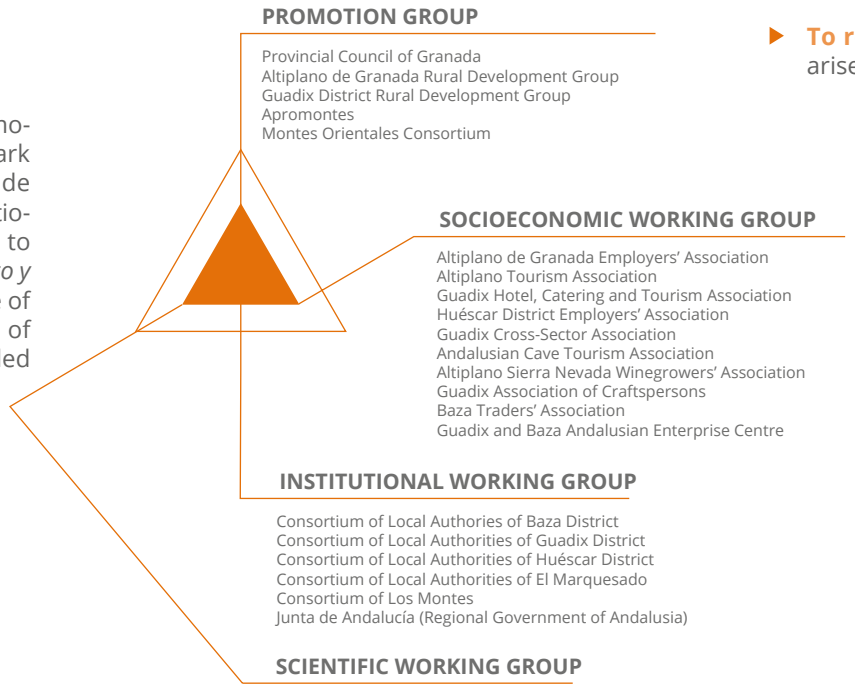


Fig. A.11 | Structure and composition of the Working Groups

Fig. A.10 | Structure and composition of the Coordination Committee of the Granada Geopark

A2.4.3. Staff involved and funding

It must be emphasised that being a UNESCO Geopark **does not entail any funding, but rather a commitment to joint responsibility** on the part of all the local public and private agents for planning and management of the territory, through the mechanism of the Geopark.

The planned funding and investment for the Granada Geopark comes from the entities that constitute it and from the external funding that may be attracted through them. In this respect, the following should be highlighted:

- The Spanish State is contributing **12 SEPRONA (Spanish Nature Protection Service) agents** in the territory, specializing in conservation of nature and the environment.
- The Geological and Mining Institute of Spain, under the authority of the Ministry of Science and Innovation, is contributing the facilities of the **River Fardes Valley Palaeontological Station.**
- The Regional Government of Andalusia (Junta de Andalucía) has **29 environmental agents** operating in the area to protect the natural and environmental heritage.
- At a local level, the **town councils in the Geopark** provide maintenance and staff for the museums and information centres, as well as the tourist offices. There are also six municipal environmental officers working for the sustainability of the local organisations in the Geopark and to improve of the quality of life of its inhabitants.

Finally, it should be mentioned that in order to ensure that the Geopark functions properly, it is essential to have qualified staff with experience in a range of subjects who are familiar with the territory to manage and implement the actions established in the development strategy designed and prepared through a process of active participation of the local population.

It is worth emphasizing that the entities that are signatories to the Geopark's foundation protocol are selflessly providing the human resources to make up the multidisciplinary technical team working to serve the territory, devoting part of their time and professional experience.

The table in Fig. A. 12 shows the working areas and specialities of the members of the Geopark's Technical Team:

Fig. A.12| Technical Resources table

TECHNICAL RESOURCES			
AREA	PROFESSIONAL FIELD	POSITION/ORGANISATION	STRUCTURE
LOCAL MANAGEMENT AND DEVELOPMENT	Sustainable local development	Head of Local Development Service Provincial Council of Granada	Management
		Senior development officer Provincial Council of Granada	Technical Department / member of the Technical Committee
	Rural development	Manager of Altiplano Rural Development Group Manager of Guadix Rural Development Group Rural development officer of Altiplano Rural Development Group Rural development officer of Guadix Rural Development Group Manager of Montes Orientales Development Consortium	Members of the Technical Committee
EARTH SCIENCES	Geological sciences	Senior Lecturer in the Department of Geology at the University of Jaén	Coordinator of the Scientific Committee Geologist of the Geopark
TOURISM	Tourism planning and development	Officer of the Provincial Tourist Board Officer of the Territorial Tourism, Regeneration, Justice and Local Administration Delegation of the Junta de Andalucía (Regional Government)	Member of the Technical Committee
COMMUNICATION	Communication	Communications officer Guadix Rural Development Group	Member of the Technical Committee

A2.4.3.1. Scientific Committee

In addition, the Geopark has a **multidisciplinary scientific working team,** consisting of researchers of recognised standing with extensive experience in projects and scientific research on the subject. This working group has the task of advising, coordinating and promoting actions related to the study, analysis and investigation of resources, as well as advancing scientific knowledge and its dissemination. It has been conducting its actions since 2015 and has participated actively in the proposal to define the scope of this project and in the scientific studies that endorse the exceptional nature of the territory.

A2.4.4. Summary of the Geopark's strategic plan

AREA OF ACTION	LINE OF ACTION	ACTIONS	OUTCOMES
GEOLOGY AND TERRITORY	GEO-CONSERVATION	Conservation and protection of sites of geological interest (SGIs) Conservation and protection of other sites or aspects of natural, cultural and scenic heritage	**SCIENTIFIC PROGRAMME**
	GEO-KNOWLEDGE	Identification and cataloguing of SGIs Study and definition of use of SGIs Formulation and updating of the geological scientific discourse of the Geopark Identification and cataloguing of other sites or aspects of natural, cultural and scenic heritage Study and definition of use of other sites or aspects of natural, cultural and scenic heritage Formulation and updating of the other discourses linked to natural, cultural and scenic heritage of the Geopark Supplementary geological discourse	
	TERRITORIAL IDENTITY	Promotion of geological, natural, cultural and scenic heritage	
MANAGEMENT STRUCTURE	PLANNING, OPERATION AND MANAGEMENT	Coordination meetings of the various bodies and working groups or committees Formulation and evaluation of the Geopark's overall strategy (*master plan*) Diagnosis of infrastructure Catalogue of scientific documents Definition and development of the marketing strategy Definition and implementation of the communication plan	**STRATEGY OF THE GRANADA GEOPARK**
	PARTICIPATION	Formulation and development of the participation plan Creation and development of a volunteer network	**MARKETING PLAN**
	THE GEOPARK AS COLLABORATOR	Coordination and collaboration with local, national and international entities Study visits and networking Implementation of joint actions cooperating with other geoparks or territories aspiring to become geoparks at a regional, national and international level	
AWARENESS-RAISING AND EDUCATION	SENSITISATION AND RAISING PUBLIC AWARENESS	Development of popularisation activities and production of publications and materials for this purpose Heritage interpretation programme (Open Geopark) Other sensitisation and awareness-raising activities: competitions and/or prizes for videos, photographs, narratives, stories, reports, etc. European Geoparks Week	

Fig. A.13| Master Plan of Geopark Granada Pt. I

AWARENESS-RAISING AND EDUCATION	GEO-EDUCATION	Geological knowledge programme and other issues of interest: teachers and students Development of teaching units and resources Design of educational programmes and materials University education: summer courses, field trips, work experience, collaborations, etc. Support for master's dissertations and final degree projects: *Your project is better in the Geopark*	**EDUCATION PROGRAMME / RESEARCH ON ENVIRONMENTAL EDUCATIONAL METHODOLOGY AND INTERPRETATION**
	ENVIRONMENTAL EDUCATION	Design and development of environmental education programmes addressing the following subject areas: conservation of geological heritage and of other sites or aspects of natural, cultural and scenic heritage; other environmental problems of the Geopark (including environmental risks); impact of global climate change on the Geopark; sustainability in ecotourism destinations	
GEOTOURISM	TOURISM OBSERVATORY	Periodic reports characterizing tourism supply and demand	**SUSTAINABLE TOURISM DEVELOPMENT PLAN**
	TOURIST INFORMATION	Diagnosis of visitor information and service centres Adaptation of information offices Network of visitor outreach and service centres Development and accreditation of tourist information points Development of basic information material	
	TOURISM TRAINING ACTIONS	Awareness/training actions to improve the knowledge and abilities of the various stakeholders of the Geopark (tourism demand and supply, improvement and adaptability of tourism infrastructure, environmental quality and management systems, corporate social responsibility, tourism products and promotion, marketing, new business activities in demand or other topics of interest related to geotourism)	
	SMALL INFRASTRUCTURE FOR TOURIST PUBLIC USE	Development of a signage manual Signposting of accesses and routes on road links Signposting in population centres Interpretative signage at SGIs and other resources of interest in natural, cultural and scenic heritage Adaptation of elements of natural, cultural and scenic heritage interest for visits Creation, improvement and modernisation of interpretation centres and museums Maintenance of the network and creation of geotourism and ecotourism itineraries (hiking, mountain biking, horseriding, etc.) Maintenance and creation of other small infrastructure (viewpoints, car parks, motorhome parking, etc.) Maintenance and creation of heritage-themed itineraries	

A2.5. Facilities and infrastructure

To be able to offer general information on the Geopark and its resources there is a network of facilities and infrastructure open to visitors.

A2.5.1. Headquarters in the Granada Geopark

1. Headquarters of the Guadix District Rural Development Group (Guadix)

A non-profit association that manages initiatives aimed at supporting entrepreneurs and improving and creating small infrastructure for public use. In addition, it promotes all projects that enhance natural and cultural heritage, creating employment, wealth or improvement of the quality of life in the district of Guadix, fostering equality of opportunities between men and women.

2. Headquarters of the Granada High Plateau Rural Development Group (Baza and Huéscar)

A non-profit association that aims to serve as a nucleus for convergence and representation of all the institutions, entities and agents, both public and private, interested in the all-round development of the municipalities that make up the area of action. Both its headquarters have offices, lecture rooms and spaces with capacity to hold events, conferences and training activities.

A2.5.2. Tourist information offices

The territory has six Tourist Information Offices which offer information on the tourist attractions of the territory and the range of cultural, scientific and outreach activities offered in the Geopark, as well as general information on the services and equipment available for tourism (accommodation, catering, communications, points of interest, activities, etc.).

Fig. A.13| Pt. II
Master Plan

A2.5.3. Viewpoints in the Geopark

A trip to these valleys in the Granada Geopark immerses the visitor directly in **the Quaternary,** which has the oldest human remains and ancestral traditions in Europe, but is also home to the best fossil record of large mammals from the Quaternary, with truly astonishing deposits containing some of the animal species that inhabited the area **during the last 2.5 million years.**

From a geographical perspective, the central elements in the history of this Geopark are a palaeo-river and a palaeo-lake, which were active from approximately 5.5 million to half a million years ago. For most of the last 5 million years the territory of the Granada Geopark contained a large lake which had no outlet or connection to the sea (it was an endorheic basin), becoming a trap for sediments and remains of organisms of the past, and now represents **one of the best continental fossil records** for the Quaternary Period (the last 2.53 million years) on the entire planet.

This large expanse of land began to be drained only half a million years ago, beginning a new stage: the emptying of the lake, through a single river course (a single outlet), towards the Atlantic Ocean, for which its waters (and the sediments they carried) travelled hundreds of kilometres. This process of emptying the basin via the river, which continues to this day, is what has gradually shaped the present landscape, characterised by thousands of badlands.

To observe all these spaces of such importance in the Geopark, there is a **network of viewpoints** currently comprising the following places: Negratín Viewpoint (Cuevas del Campo), Jabalcón Viewpoint (Zújar), Cueva de los Amos Viewpoint (Castilléjar), Llano de Olivares Viewpoint, Megalithic Park (Gorafe), Megalithic Interpretation Centre Viewpoint (Gorafe), Alicún Spa Viewpoint (Villanueva de las Torres), Ruta del Mencal Viewpoints (Pedro Martínez), Benalúa Viewpoint, El Águila Viewpoint (Fonelas). Fig. A. 14

GEOTOURISM	TOURISM PRODUCT CREATION	Design of tourism products Development of storytelling for the various tourism products Geological tourism Cave-dwelling Astrotourism Megalithic tourism Enotourism Active tourism and sporting events Other products Definition of tourism packages and activities with the business sector	**SUSTAINABLE TOURISM DEVELOPMENT PLAN**
	TOURISM PRODUCT CLUB	Analysis and implementation of tourism product clubs (e.g., ecotourism or enotourism)	
	THE GEOPARK AS PROMOTER	Development and publication of a range of promotional material (brochures, leaflets, etc.) Geopark tourist guide Offline promotion (fam trips, press trips, events, etc.) Online promotion (website, social media, positioning, etc.)	
SUSTAINABLE ECONOMIC DEVELOPMENT	GASTRO-TOURISM	Development of “Flavours of the Geopark”	**GEOPARK BRAND / CORPORATE SOCIAL RESPONSIBILITY**
	THE GEOPARK AS ENTREPRENEUR	Studies of local varieties and improvement of the productivity of local and/or ecological products Information/demonstration/training activities on promoting farm products and local crafts. Support for small agroecological production initiatives and small-scale agrifood industries. Support for developing and recovering crafts and traditional trades Support for companies in the tourism sector (accommodation, catering, supplementary activities, etc.) Support for companies that contribute to diversifying the economy of the territory (services for the population and the rural economy, circular economy, etc.) Development of the “Sabor Granada” (“Granada Flavour”) brand in the territory Development of the “Calidad Rural” (“Rural Quality”) European territorial quality mark in the territory Analysis and development of short marketing channels for agricultural and craft products (local markets, shop network, events with HORECA channel, etc.) Creation of intersectoral business cooperation forums and networks	

Fig. A.13| Pt. III
Master Plan

Fig. A.14| The Granada Geopark has spectacular viewpoints overlooking a unique landscape.
@Alberto Tauste

A2.5.4. Signage and information panels

The Granada Geopark has signposts and information panels installed at the points of greatest interest. The object is to help people get to know the Geopark and its resources, reaching various types of users. The signage has therefore been designed on the basis of accessibility and straightforward language that brings scientific knowledge closer to the general public. The contents are displayed in both Spanish and English to make it easier for visitors from other countries to understand them. Figs. A. 15 and A. 16

Fig. A.15| Information panel on the seismites

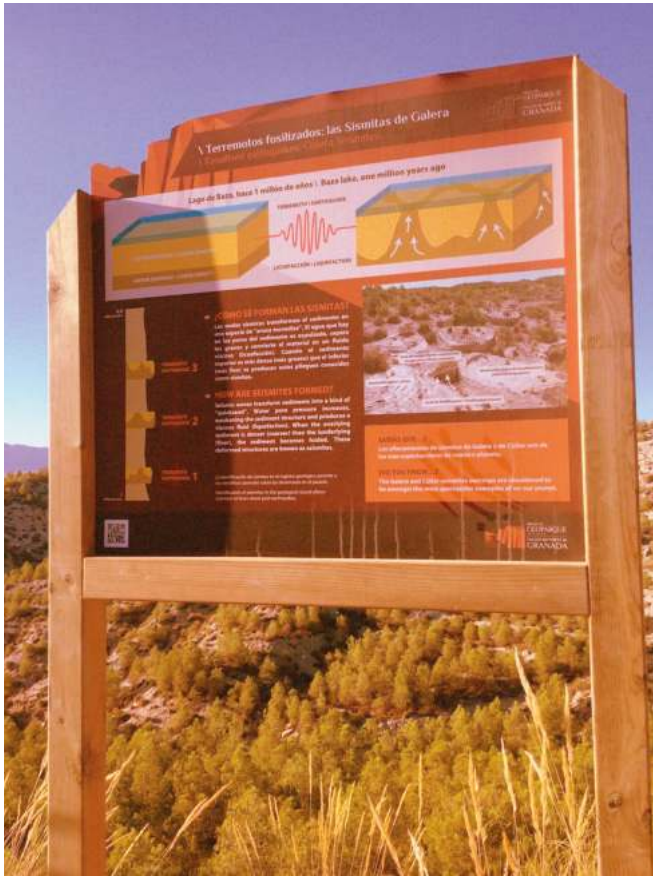


Fig. A.16| Interpretation panel at the Alicún Spa

A2.5.5. Network of museums and heritage interpretation centres

The Granada Geopark has created a network of information centres on local heritage, which include the following centres:

CULTURAL TOURISM | GEOEDUCATION | GEOTOURISM | GEOCONSERVATION | RESEARCH | TEACHING | ECOTOURISM

River Fardes Valley Palaeontological Station (Fonelas)

This is an exceptional facility belonging to the Geological and Mining Institute of Spain, in which research, dissemination and specialised teaching in the field are conducted in parallel. Since its research began in 2001, more than 3,000 fossilised bones have been recovered, represented 38 species of animals, among which we find 24 large mammals. It is one of the few centres of this nature that allow the palaeontological remains found to be studied and visited in situ.

The excellent conditions for observing the landscape from this Station make it possible to expand the content accessible to the public and show how the geology and landscape of the setting have evolved. It carries out intense daily activity of visits from schools, the scientific community and groups of visitors.

Josep Gibert Interpretation Centre on the First Settlers in Europe (Orce)

This centre, through its exhibition, enables visitors to take a trip into the past and go back 1.5 million years, revealing what the climate, the flora and the exotic fauna were like when our most remote ancestors lived in the territory of the Geopark. It draws on the material and the scientific information generated in the Sites of Geological Interest, of international significance, that are located in the territory: Venta Micena Palaeontological Deposits, Barranco León-5 and Fuente Nueva-3. There are guided visits for tourist and school groups, as well as general scientific communication activities *(Science in your Town),* and it has a large space for pursuing research activity.

Gorafe Megalithic Park and Megalithic Interpretation Centre

This area contains more than 240 Neolithic dolmens scattered over 10 necropolises, making it one of the largest concentrations of prehistoric tumuli or burial mounds in Europe. To protect and promote them, the Gorafe Megalithic Park, which includes the Megalithic Interpretation Centre, was created in 1998.

It also has the Star Park (certified by the Starlight Foundation), where astronomical observation activities are conducted. The surrounding area offers opportunities for hiking and cycling routes. Its privileged position makes it a viewpoint for the spectacular and extensive gullied landscape formed in clayey and sandy terrain, with reddish and pinkish hues.

CIYA: Archaeological Sites Interpretation Centre (Baza)

This is part of the surroundings of the archaeological complex of Cerro Cepero, the site of the Ibero-Roman city of Basti, and the necropolises of Cerro del Santuario, where the Lady of Baza statue was found in 1971, and Cerro Largo. In its exhibition area of more than 700 square metres, the CIYA is equipped with the most modern audiovisual technology in the service of a museum design that offers visitors a magnificent presentation for an understanding of the social, cultural, economic and religious processes of the successive cultures that settled in Basti and its territory.

Baza Municipal Archaeological Museum

The Baza Museum is located in the heart of the historic centre of the city, declared a BIC (asset of cultural interest) Historic Complex in 2003, in the vicinity of what was the medina of Muslim Baza. Its premises occupy two adjoining historic buildings dating from the sixteenth century (one of them a former corn exchange). The Museum has eight permanent exhibition rooms, distributed over a net floor area of more than 1,000 m2, in which visitors can make a complete tour of the history and archaeology of Baza and its district, from prehistoric times to the modern era, including Iberian culture, the Roman world, the Visigoths and the Middle Ages. As well as these rooms, the Museum has two spaces for temporary exhibitions, in the patio and upper gallery of the Corn Exchange building. Once a year Lady of Baza Week is celebrated, with various cultural and leisure activities.

Castellón Alto Archaeological Site (Galera)

The settlement of Castellón Alto, where between 80 and 100 people may have lived, belongs to the Argaric culture, in an advanced period of the Bronze Age (1900–1600 BC). It is now partially reconstructed and visitors can discover what everyday life was like in an Argaric settlement more than 3,500 years ago.

Almagruz Cave-Dwelling Habitat (Purullena)

This is a set of human habitats ranging from prehistoric settlements to modern cave-house accommodation. In addition, it has an interpretation centre where various types of teaching activities are conducted with local schoolchildren.

Galera Archaeological Museum

The Galera Museum offers an archaeological tour from the Copper Age to our more recent past. In the first room, the well-known partially mummified remains from grave 121 at the Castellón Alto Site ("the Galera Mummy") are displayed. These are the oldest and best-preserved prehistoric human remains after Ötzi the Iceman (the 5,000-year-old frozen mummy discovered in the Alps in 1991). It also presents an ethnographic room, with a survey of the age-old process of winemaking, esparto and hemp weaving, and traditional dwellings. Reproductions of ceramic pieces found at the sites in the area can be bought at the Museum.

Puebla de Don Fadrique Archaeological-Ethnographic Museum

The Museum presents a journey through the prehistory and history of the area, with an innovative thematic approach. Here visitors can enjoy a virtual visit to the site of the Roman camp at Cerro del Trigo, an area of just over a hectare founded in 100 BC with the function of organizing the territory of Bugéjar again after the destruction and consequent abandonment of the two main Iberian cities and keeping control over the Via Heraclea where it passed through this area.

The Museum also has various rooms devoted to ethnography, showing a range of traditional trades through scenes represented with scale models.

Castilléjar Ecomuseum

This is a space dedicated to promoting and interpreting the landscape and the trades typical of a particular ecosystem, such as the one that characterises the Geopark.

The Castilléjar Ecomuseum reveals the interaction between nature and human beings, illustrating their co-evolution and the traditional ways of using the territory, with the aim of preserving its eco-diversity. Its activities focus on the conservation, dissemination and recovery of the surroundings and of a way of life tied to the land, characteristic of the area. There are visits to exhibitions, guided routes, training, workshops and activities tailored to groups and visitors.

Tutugi Archaeological Site (Galera)

Together with the Cerro del Real site, this is part of the Ibero-Roman city of Tutugi. The necropolis has been known archaeologically since 1920.

The Tutugi burial mound complex, probably one of the largest in the Iberian world, has more than 100 graves, very varied in both their modes of construction and the quality of their grave goods, among which the famous alabaster figurine of a deity known as the Lady of Galera was found. Closely related to the city of Tutugi and its necropolis are a series of small shrines where rituals of some kind would have been performed. There are daily visits of schoolchildren, the scientific community and groups of visitors.

Cave Interpretation Centre (Guadix)

This resource presents visitors with a very full view of the origin of cave dwelling in the world to focus the exhibition content on the various neighbourhoods of caves in Guadix and its district, with their own special character and features.

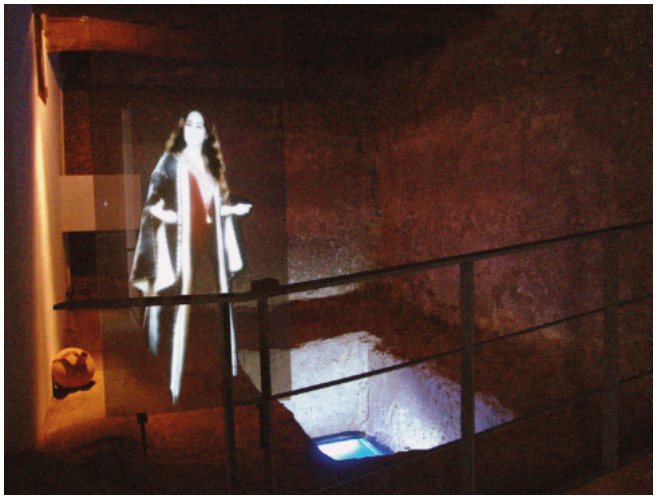
Castril Castle Visitable Site

Although the rock where it is situated has remains of habitation from before the Islamic period, the most obvious signs of occupation are from the eleventh century onwards, and especially during the Nasrid period after the Christian conquest. Today the remains bear witness to a rectangular ground plan with towers, cisterns and walls forming part of a defensive system that extends over neighbouring areas of the rock; and on the highest part of the latter stands the statue of Christ of the Sacred Heart, rebuilt after being damaged by lightning a few years ago. Access to the remains is through the tourist office located by the church. It is important to emphasise that the historic centre of Castril has been declared a "Complex of Historical Interest" and it is worth taking a leisurely walk round every corner of it.

Segureño Lamb Interpretation Centre (C.I.C.O.S.)

This offers visitors an exhibition on every aspect of a unique product of the area: Segureño Lamb.

Situated in the renovated Church of the Monastery of St Francis, its rooms enable visitors to discover the features of this local breed, its history and everything to do with rearing it, as well as the exceptional qualities of its meat and the recipes, both traditional and modern, for how to cook it.



Ferreira Moorish Architecture Interpretation Centre

Ferreira Castle houses this innovative modern interpretation centre, which presents a tour of the various historical sights and buildings of the Marquisate of Zenete that are still preserved (baths, castles, watchtowers and cisterns), with an entertaining and instructive explanation of the distinctive features of Muslim architecture. The visit is structured in ten spaces, where various aspects of the Islamic past of the Marquisate are staged.

It is a journey in time to discover the culinary practices, agriculture, livestock farming and way of life of the Andalusi populations who occupied these lands for eight centuries. The defensive tower where it is located gives this centre a special significance, as it allows us to get to know the architectural and functional development of this historic building from its construction in the twelfth century to the present day.

Dólar Moorish Baths Interpretation Centre

After the recovery and restoration of the remains preserved under the former town hall building, the Moorish Baths have been turned into a museum to be used as a thematic interpretation centre on Water in *Al-Andalus.*

The survey of the history of Moorish baths, their significance and operation, enables us to familiarise ourselves with one of the key elements in the birth and development of *Al-Andalus:* water. Without this basic element of life, it is impossible to understand the wealth and splendour attained by Islamic culture.

In all these centres and facilities information can be obtained on the Geopark and its rich heritage. In addition to the infrastructure and equipment described, the territory offers a wide range of additional installations that supplement this varied range of tourism options.

A2.5.6. Training centres in the territory

1 International School of Rural and Nature Tourism (ENTURNA)

Centre for creating and disseminating knowledge in the field of rural and nature tourism, helping to train businesspeople and entrepreneurs, workers, students and the local population.

2 Teacher In-Service Training Centres (Guadix and Baza)

Centres for ongoing training of teachers in the Andalusian education system, with independence in instruction and management to adapt teaching to the new educational needs of students. The training activities for teachers in relation to the educational programme of the Granada Geopark are developed and coordinated at their facilities.

48 Guadalinfo Centres

Spaces belonging to the Andalusian Social Innovation Network, under the authority of the regional government, which are distributed throughout the territory.

They conduct training activities in digital competences for the population and promote collective initiatives for social revitalisation, community awareness and promotion of the environment. They take action on employability, digital literacy, promotion of a culture of innovation, public participation, improvement of quality of life, enterprise, business digitalisation and electronic administration.

6 Andalusian Enterprise Centres (Baza, Guadix, Huéscar, Benalúa, Cuevas del Campo and Alquife)

A public foundation attached to the Department of Economy and Knowledge of the Andalusian Regional Government. They are responsible for developing free services to foster and support the creation and consolidation of businesses and employment in the territory.

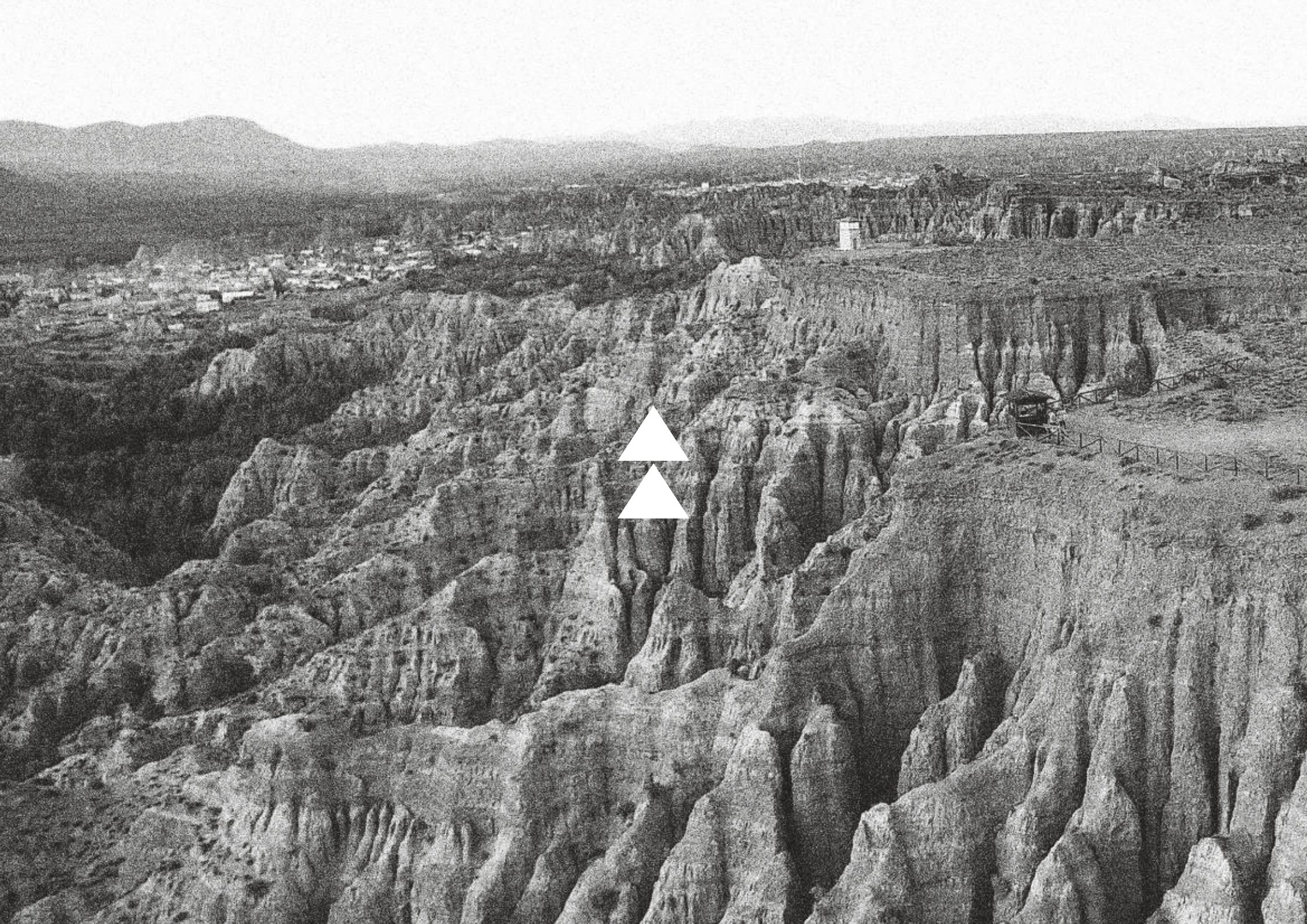
Fig. A.17| Characteristic landscape of the territory formed by cave houses *@Guadix Rural Development Group*

A2.5.7. Accommodation

The Geopark has a total of **5,169 tourist accommodation places** divided between the categories of hotels, hostels, guest houses, apartments, campsites and rural accommodation. Fig. A. 17

Within the types of tourist accommodation, the cave house stands out as a habitat inseparably linked to the geological nature of the territory. The cave house represents important cultural, ethnological, artistic, social and scenic values, exclusive to this setting.

Cave houses have become one of the greatest tourist attractions in the area. Built with forms and volumes that depend on the characteristics of the terrain in which they have been excavated, they constitute a unique element of bioclimatic construction. One of the main ecological advantages of the cave house is its pleasant interior temperature. The distinctive construction of cave houses produces balanced climatic conditions: cool in summer and protected from the cold in winter. Another advantage is the pleasant relative humidity level of the air inside, around 50%, in contrast to the overheated spaces of conventional houses in winter, dried out by heating. Conversely, the air density of cave houses represents an ideal situation for controlled ventilation.



B

GEOLOGICAL HERITAGE

B1. MAIN GEOLOGICAL DATA

With an area of 4.722 km2, the Granada Geopark represents one of the landscapes least altered by human action within the European continent. The arid nature of most of the region, with little plant cover on the sides of the valleys, facilitates observation of the main **geological, geomorphological and palaeontological features that distinguish and characterise this Geopark.**

Among its main geological values, it is worth highlighting its **complete continental sediment and fossil record, deposited during the Pliocene and Quaternary (from 5.5 million years ago),** representing one of the most interesting sites worldwide for studying the Quaternary Period in continental settings (the Quaternary Period began 2.58 million years ago and is characterised, among other events of great importance, by the appearance of the genus Homo and a cooling of the climate that gave rise to the last glacial periods to have occurred on our planet).

The earliest records of research in relation to the geology of this territory, known geologically as the Guadix-Baza Basin, date back to the first half of the seventeenth century. From the 1970s an intense period of research on it began. This phase, which was very productive in terms of the geological and palaeontological knowledge generated, was ushered in by the discovery of some palaeontological deposits of fossil macrovertebrates encompassing the Pliocene, the whole lower Pleistocene and part of the middle Pleistocene. Along with the palaeontological work, the first detailed stratigraphic studies already revealed a Plio-Quaternary continental succession unique in Europe in its thickness, continuity and expanse.

During the 1980s and 1990s, research and conservation in the territory centred on palaeontological studies, supported by stratigraphic and sedimentological studies of a regional nature, research that has continued intensively up to the present. This work has shown that the Granada Geopark hosts **the most extensive collection of Quaternary continental vertebrate fossils in Europe** and one of the most complete from the chronological point of view. Among the fossils of large mammals within the Granada Geopark, it is worth highlighting the presence of **the oldest human remains in Europe.** Human presence in the area of the Geopark, more than a million years ago, is also corroborated and complemented by the finding of lithic industries associated with the fossil remains at the Orce sites and other less well-known sites. As well as its rich and extensive geological and palaeontological heritage, the Granada Geopark contains spectacular fluvial shaping, most notably in its badlands landscape. This badlands landscape, which occupies the central part of the area away from the main roads, is undoubtedly one of the distinguishing features of the Geopark. It is a rugged landscape, consisting of thousands of gullies and ravines of various sizes, formed by water erosion over the last half million years (during the most recent Quaternary).

What the Granada Geopark contributes to the Global Geoparks network is a natural geological and scenic context directly related to the geological and palaeobiological process, agents and results that occurred during the Plio-Quaternary on the European continent, where Stratigraphy/Historical Geology, Palaeontology and Geomorphology constitute the three fundamental pillars of the geology of the territory. However, the Geopark's set of fluvial valleys has not only given us direct access to the whole collection of sediments and continental fossils of that period, but has also produced outcrops of much older rocks, **up to more than 250 million years old,** giving the Granada Geopark a spectacular geodiversity, with an exceptional Plio-Quaternary, a very remarkable Neogene and Palaeogene and a Mesozoic rarely found in the Iberian Peninsula, related to the rifting that took place during that period of time.

All these geological values are now represented by **72 sites of geological interest** present in the Granada Geopark, a number that will gradually increase in the future to incorporate other places of unquestionable scientific, didactic and tourist value. Some of the present sites of geological interest are of international significance, such as important faults, outcrops of palaeoseismites, outcrops of Mesozoic pillow lavas and palaeontological deposits.

4.722km² in area

5,5 milllons years old

Most extensive **collection of Quaternary continental vertebrate fossils** in Europe

Oldest human remains in Europe

Geological remains up to more than **250 million years old**

72 sites of geological interest

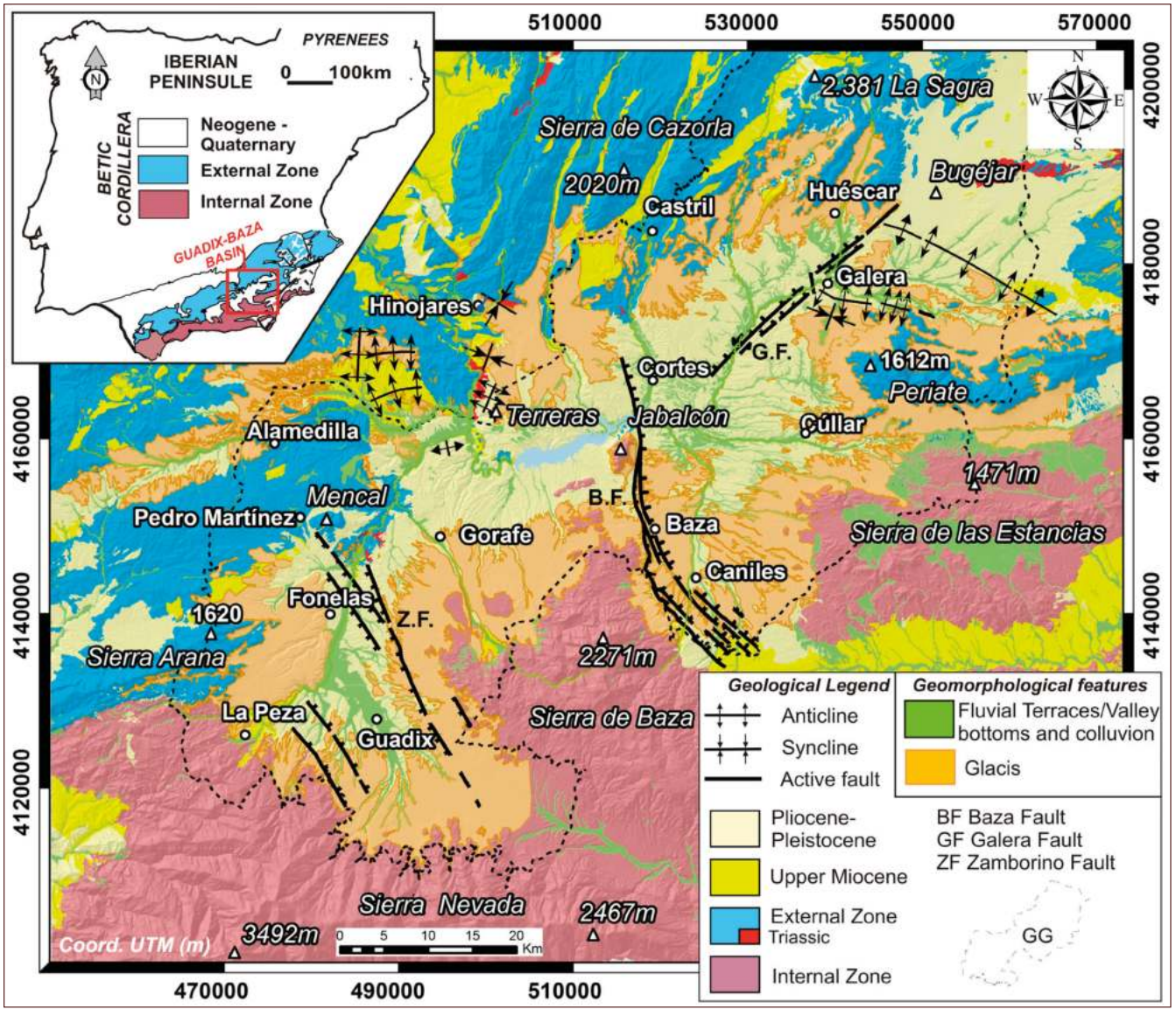
B2. GEOLOGICAL CONTEXT

The Granada Geopark is located in the **central sector of the Baetic Mountain System,** which occupies the south and southeast of the Iberian Peninsula, extending to a length of some 600 km by approximately 200 km wide. The Baetic System can be divided into several substantial geological domains, of which the most prominent are the External Baetic Zone and the Internal Baetic Zone (the latter also being known as the Alborán Domain). On these domains several Neogene basins formed, including the **Guadix-Baza Basin,** to which most of the territory of the Granada Geopark belongs.

These Neogene basins could be regarded collectively as another great domain within the Baetic System, whose main domains and subdomains are represented in the territory of the Granada Geopark, forming part of the basement of the Guadix-Baza Basin. Fig. B. 1

The **External Baetic Zone** occupies the southern and southeastern margin of the Iberian Massif, in which, during the Mesozoic and part of the Cenozoic, primarily marine sediments accumulated and were subsequently deformed and emerged. It is divided into the Subbaetic and the Prebaetic. The latter was closer to the edge of the plateau and its marine facies are shallow, whereas in the Subbaetic deep pelagic facies are found. The Prebaetic appears on the NW edge of the Geopark (Castril, Huéscar and Puebla de Don Fadrique mountains). The Subbaetic emerges in the western, northern and northeastern sectors of the Geopark, both in the mountains (Arana, Mencal, Montes Orientales, Huéscar, Puebla de Don Fadrique and Orce-Cúllar) and at the bottom of some valleys. The Subbaetic Triassic, with red detrital sediments, versicolour gypsums and carbonates, represents the oldest sediments in the External Zone of the Baetic System. In general, the Jurassic rocks of the External Zone are represented by dolomites and limestones, while among the Cretaceous and Tertiary rocks there is a predominance of marly limestones, whitish or sometimes salmon-coloured marls, and calcarenites.

Fig. B. 1



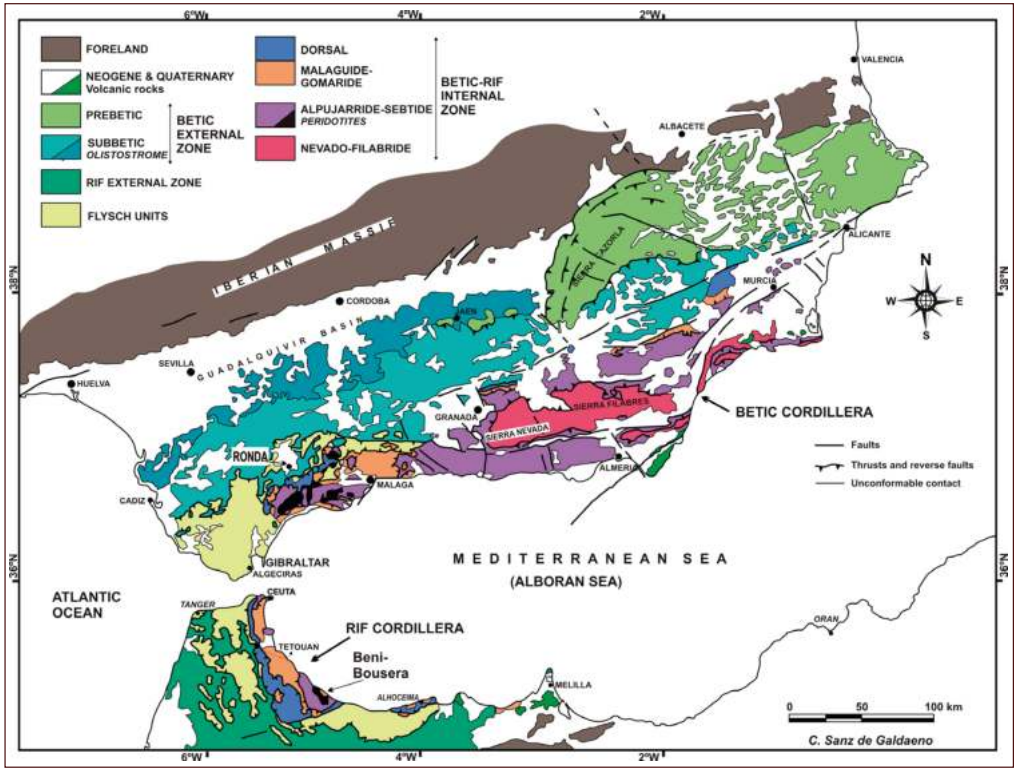


Fig. B. 2

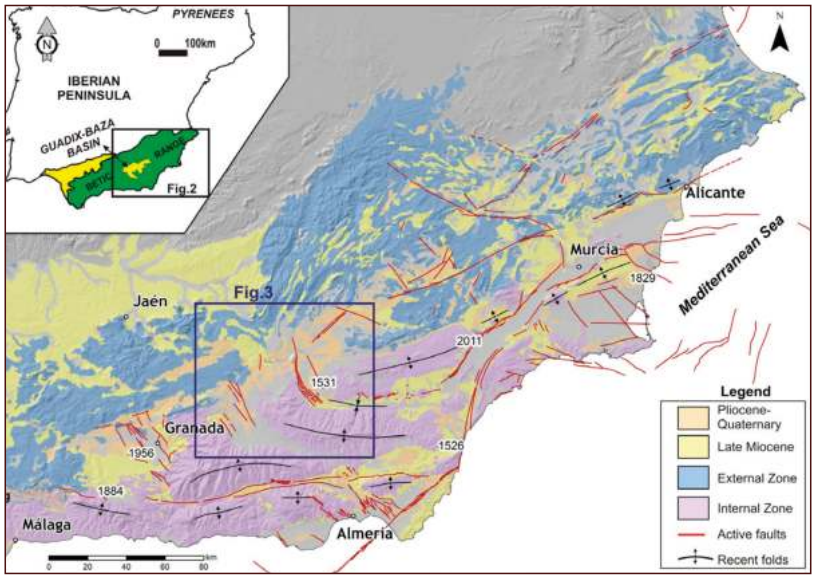


Fig. B. 3

Fig. B. 1| Geological/geomorphological map of the Guadix-Baza Basin, indicating the boundary of the GG and the main geological domains and active structures related to it

Fig. B. 2| General geological diagram of the Baetic System with its main geological domains and surrounding areas

Fig. B. 3| Simplified geological map of the eastern Baetic System, showing the position of the Guadix-Baza Basin

The **Internal Baetic Zone** is divided into several tectonically superimposed complexes, which, from top to bottom, are the Maláguide/Dorsal, with no Alpine metamorphism, and the Alpujárride and Nevado-Filábride, both with Alpine metamorphism. Most of the sediments that gave rise to the Maláguide, Dorsal and Alpujárride rocks were deposited far from their present positions, towards the east and southeast, in some cases several hundred kilometres away, and were subsequently displaced to where they are now. Unlike the External Zone, the Internal Baetic Zone presents rocks from the Palaeozoic, as well as from the Mesozoic and the Tertiary.

In the Granada Geopark, the ***Maláguide*** **Complex** outcrops on the western edge (the eastern part of the Sierra de Huétor mountains, in the vicinity of Diezma) and on the eastern edge (east of Cúllar). In its central part, the Cerro de Jabalcón, one of the Sites of Geological Interest, is attributed to the Dorsal Complex. Rocks belonging to the **Dorsal** also outcrop in the most easterly part of the Sierra Arana mountains, at the westernmost end of the Geopark.

The **Alpujárride Complex** emerges in some of the mountain ranges that make up the southwestern, southern and southeastern edge, such as the Sierra de Huétor-Sierra Nevada, Sierra de Baza and Sierra de las Estancias. In addition, we can find rocks from the *Alpujárride* at the bottom of some valleys cut into the intramontane depression, close to those mountain ranges, such as the River Gor valley, some ravines in the vicinity of Zújar and Freila, or in the watercourses of Cúllar, among other places.

The **Nevado-Filábride Complex** emerges at the southern edge of the Granada Geopark (the northern edge of the Sierra Nevada) and in the westernmost foothills of the Sierra de los Filabres.

As for the Neogene basins, which are the best preserved within the Baetic System, they were formed starting in the Upper Miocene and are intramontane basins. They notably include the **Guadix-Baza and Granada basins,** while that of the Guadalquivir represents the foreland basin of the Baetic System. These basins were formed on both the Internal and the External Zones, or on the contact between the two, as in the case of the Guadix-Baza basin, to which most of the Geopark's territory belongs. Figs. B. 2 and B. 3

B3. BRIEF GEOLOGICAL HISTORY OF THE TERRITORY OF THE GRANADA GEOPARK

Although pride of place in the territory of the Granada Geopark goes to the fossil sediments of the past 5.5 million years, as well as the erosional processes that have been shaping the landscape for the last half million years, the geological history of the area dates back at least as far as the **Triassic Period, 250 million years ago.**

The Triassic is a special period in the Earth's history, as it represents the last time that all the continents were joined together forming the supercontinent Pangaea. In the rivers of that supercontinent and the shallow sea that surrounded it, the Triassic rocks that outcrop within the Granada Geopark were formed. At the end of the Triassic, Pangaea began to break up and the formation of incipient seas and oceans began. Within the Granada Geopark, **the volcanic rocks of the Alamedilla sector (pillow lavas)** are a magnificent vestige of the fracturing of the Earth's crust that occurred from the end of the Triassic to the Cretaceous. At the bottom of the new marine basins resulting from the fracturing and separation of Pangaea were deposited the sediments of the External and Internal Zones of the Baetic System, over a long period of time encompassing the Jurassic, Cretaceous and Palaeogene.

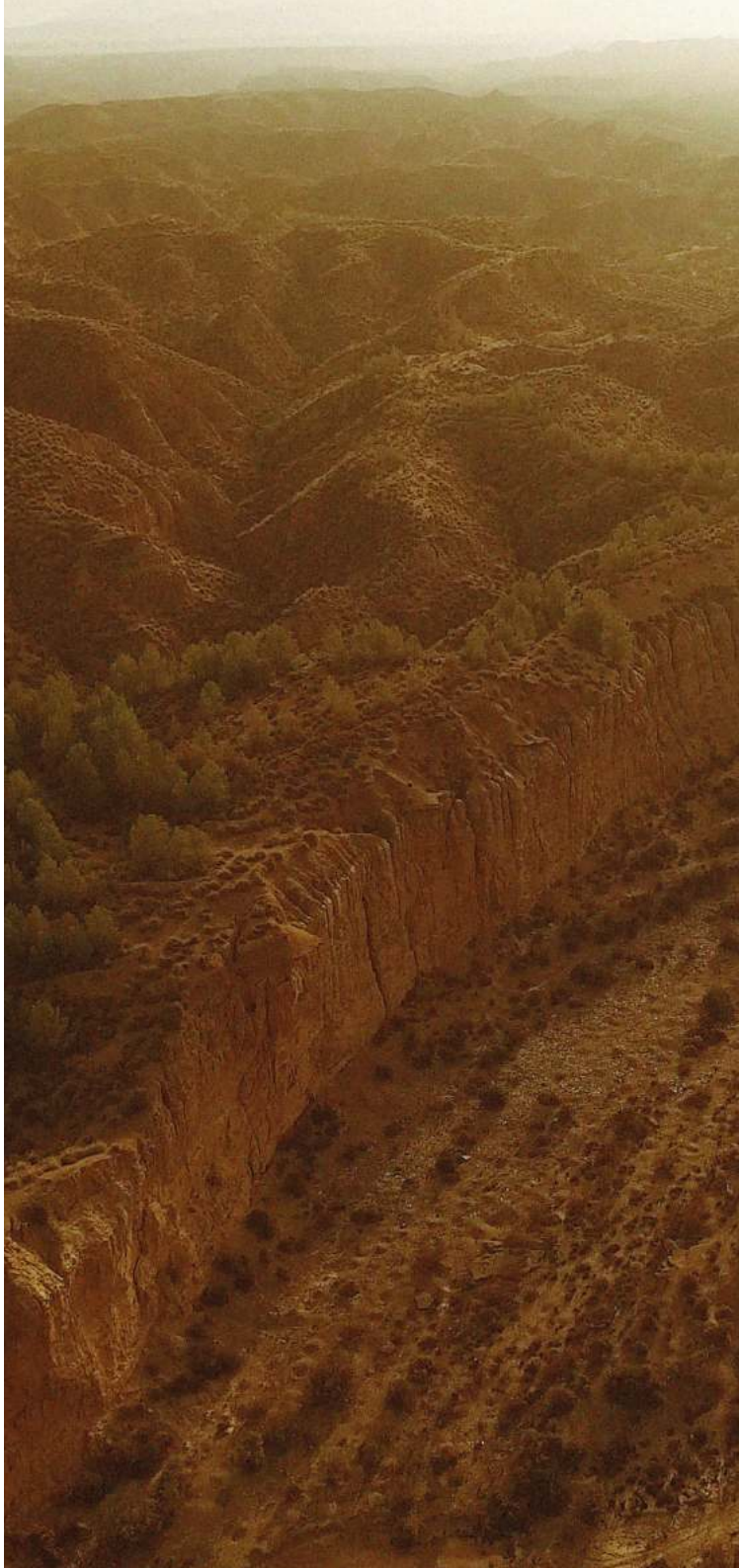
During the Palaeogene, when the Baetic System did not yet exist and most of the sediments that would later form it were still submerged, the compressions between Africa and Eurasia began, initiating the Alpine deformations. As the African plate approached the Eurasian, into which Iberia had been incorporated, during the Neogene, the materials that now constitute the Internal Zone of the Baetic System were displaced hundreds of kilometres to the west. As they advanced, they pushed and deformed the materials of the External Baetic Zone.

About 8 million years ago, in the Upper Miocene, the main landforms of the Baetic System, that is, of the SE of the Iberian Peninsula, would already have taken shape, and the Neogene basins, all of them marine at this stage, would have been created, including the Guadix-Baza Basin. Thus, the Granada Geopark sector was part of a group of intramontane basins surrounding large islands, which largely correspond to our present mountain ranges.

The interconnection of these basins, for example between the Guadalquivir and Guadix-Baza basins via the so-called Baetic Corridor or North-Baetic Strait (Colom 1952), allowed, in turn, the marine connection between the Atlantic and the Mediterranean. The marine materials of this period can be found in many outcrops within the territory of the Geopark.

Between the end of the Miocene and the beginning of the Pliocene, about 5.5 million years ago, the penultimate stage of our geological history began: the individualisation and birth of the Guadix-Baza continental basin, resulting from the final disconnection of our territory from the Mediterranean Sea and the Atlantic Ocean. This disconnection was due to tectonic factors that since the Miocene had been producing a regional uplift of the Baetic System, which is very obvious in the Granada Geopark sector; not for nothing is it one of the regions with the highest mean altitude in the entire Iberian Peninsula. Nowadays we can find **marine sediments** from the Tortonian above 1000 m in the vicinity of the Geopark (Sanz de Galdeano and Alfaro, 2004). The marine disconnection was probably also influenced by the abrupt and widespread drop in sea level that affected all the world's oceans during the Messinian.

Once the Guadix-Baza basin had originated as a continental intramontane depression, it was **endorheic;** that is, the waters from the various river systems that collected precipitation within the perimeter defined by the watershed of the whole basin had no outlet to the sea. During the Pliocene and much of the Pleistocene, the endorheic nature of the territory and the action of the **Baza Fault** allowed a large lake to develop in the central-eastern half (García Tortosa et al., 2008 to 2011), generating substantial accumulations of carbonated and evaporitic sediments in that sector, while in the western half mainly fluvial environments and detrital sedimentation developed (Vera, 1970; Viseras 1991).



The river systems of the western sector drained into the lake in the eastern sector via the palaeo-River Fardes. The differences in the sedimentary environments between the fluvial and lacustrine sectors were largely controlled by the Baza Fault, which allowed the subsidence of the eastern sector and represented the base level of the western sector. Nevertheless, in the eastern part there were also river systems originating from the surrounding mountain ranges (Castril, Huéscar, Periate, Estancias, etc.), which brought fluvial sediments, and equally, in the western sector, small lacustrine systems formed between the fluvial systems.

Over the course of the endorheic geological period, an extensive area of glacis developed in the basin from the edges towards the centre (García Tortosa et al., 2007, 2008, 2011). This area remained active up to the moment when the basin became **exorheic,** approximately 0.5 Ma ago (Scott and Gibert, 2009; García Tortosa et al., 2011, 2019). The change from endorheism to exorheism, that is, the draining of the region towards the sea, marks the beginning of the final phase of our geological history. During the period of disconnection from the sea, which lasted approximately 5 Ma, fauna of large mammals developed and coexisted on the glacis area, in a landscape that would have reminded us of the **current African savanna** (Arribas and Palmqvist, 1998; Palmqvist and Arribas 2001).

The glacis levelled materials from different periods, so the level of silting of the basin does not match, nor does such a level exist; materials of very different ages are found in the upper part of the endorheic stratigraphic succession in different sectors. The area of glacis is therefore the last vestige of the endorheic phase of this basin (García Tortosa 2007, 2008, 2011).

The last stage of our geological history began approximately **0.5 million years ago (Middle Pleistocene),** when a tributary of the River Guadalquivir captured the endorheic basin, giving it an outlet to the Atlantic ocean and transforming it into an exorheic basin, as we know it today.

After the capture, this tributary became what is now the Guadiana Menor. The fact that this capture was made towards the Atlantic and not through the Almanzora corridor to the Mediterranean (a much shorter route than the present one) was probably due to the fact that this tributary of the Guadalquivir took advantage of various factors, tectonic (faults in the Guadiana Menor sector producing areas of weakness), palaeogeographic (in the sector to the NW of the Negratín dome a palaeo-valley could already have been created in a N-S direction during the endorheic phase, also determined partly by tectonics) and lithological (the low competence of the existing materials in the palaeo-watershed between the two basins), allowing a greater advance of headward erosion (García Tortosa et al., 2007).

The high mean altitude of the Granada Geopark area, the substantial topographical height difference between this territory and the confluence of the Guadiana Menor and the Guadalquivir, the semiarid climate, and the high erodibility of the materials of which the Plio-Quaternary infill of the central areas of the Geopark is composed have given rise to the severe downcutting of the current fluvial network, up to 200 m below the surface of the glacis in some valleys. As soon as the capture took place, erosion gained the upper hand over sedimentation, the break-up of the glacis began (that is, of the great plain produced over hundreds of thousands of years), and the **current river valleys** were formed, notably including the ravines and gullies that compose the **badlands** landscape so characteristic of the territory.

The central characters in the story of this Geopark are a former river, the palaeo-Fardes, and a former lake, the Baza palaeo-lake, into which it flowed. Both existed from the Pliocene to the Middle Pleistocene (approximately from 5.5 to 0.5 million years ago) during an endorheic phase in which the waters of the rivers within the territory of the Geopark had no outlet to the sea. The palaeo-Fardes arose as it does today in the area of the Sierra de Huétor and flowed into the Baza palaeo-lake, mainly to the north of the Cerro de Jabalcón. The relationship between the two, river and lake, was controlled over time by the Baza Fault.

This great fracture, the Baza Fault, situated to the east of the Cerro de Jabalcón and more than 30 kilometres long (from the south of Caniles to the north of Cortes de Baza), was responsible for forming the palaeo-lake, by sinking the eastern sector relative to the western one which fed the lake with its waters. That is why this fault is another of the central characters in this story, and we can consider it as the natural boundary between the western and eastern sectors of the Geopark.

The rocks formed by the sediments deposited by that river and that lake hold within them the set of palaeontological deposits of vertebrates which speak to us of biological and environmental evolution during the Pliocene and the Pleistocene, with a record from the lower Pleistocene (basal Quaternary) that is unique in the European context.

The landscape that existed during the endorheic stage of the basin was an imposing and very extensive peneplain. This plain, known geomorphologically as a glacis, is still present today between the central parts of the Geopark and the mountain ranges that surround it.

It represents the last vestige of that endorheic phase and offers us the key to understanding the evolution of the most recent landscape within the territory of the Granada Geopark.

Since the end of the endorheic phase and up to the present day the River Guadiana Menor and all its tributaries have been very actively eroding the rocks, generating an extensive landscape of wonderfully preserved badlands with very little anthropic influence overall, which is undoubtedly one of the great unique features of our Geopark.

The river valleys, produced during this erosional stage in which we find ourselves, have left basement rocks exposed, and these, along with those at the edge of the basin, tell a geological history that goes back much further than 5.5 million years.

Fortunately, these badlands and the fluvial terraces of the main valleys have preserved a record of our more recent geological history, that of the last half million years, which is directly linked to the history of the people of the Geopark.

B4. SITES OF GEOLOGICAL INTEREST (SGIs) IN THE GEOPARK

B4.1. List and description

Fig. B. 4 | List and description

SGI Ref	SGI/Geosite	Municipality	Main geological interest	Importance	Active research	Use(s)
GG-01	Marchal Badlands (piping)	Marchal	Geomorphological	International		Geotourism/Education
GG-02	Fonelas Badlands (graben) (San Torcuato)	Fonelas/Guadix	Geomorphological	International		Geotourism
GG-03	Dehesas de Guadix Badlands (Puntal San Bernardino) (piping)	Dehesas de Guadix/Alicún de Ortega	Geomorphological	International		Geotourism/Cultural
GG-04	Gorafe Badlands (Puntal de Don Diego)	Gorafe	Geomorphological	International		Geotourism/Education
GG-05	Negratín Badlands (Negratín Viewpoint)	Bácor/Freila/Zújar/Negratín/Cuevas del Campo	Geomorphological	International		Geotourism/Education
GG-06	Cerro Mencal	Pedro Martínez	Geomorphological	Regional		Geotourism/Education
GG-07	Cerro Jabalcón (horst)	Zújar	Geomorphological	Regional		Geotourism/Education
GG-08	Fonelas P-1 Palaeontological Site (EPVRF)	Fonelas	Palaeontological	International	XX	Scientific/Teaching/Geotourism
GG-09	Mencal-9 Palaeontological Site	Villanueva de las Torres	Palaeontological	International	XX	Geotourism/Education
GG-10	Fonelas SCC-3 Palaeontological Site	Fonelas	Palaeontological	International	XX	Geotourism/Education
GG-11	Solana del Zamborino Palaeontological Site	Fonelas	Palaeontological	National	X	Scientific/Geotourism
GG-12	Darro Karstic Site (paleontology; Moreda 1ª)	Darro	Palaeontological (Paradolichopithecus sp.)	National	X	Scientific/Teaching
GG-13	Negratín-Delf Palaeontological Complex (dolphin + rhinoceros + plants)	Cuevas del Campo	Palaeontological	International	XX	Scientific/Teaching
GG-14	Mencal-J Palaeontological Site (Jurassic)	Pedro Martínez/Fonelas	Palaeontological (ammonitico rosso)	Regional		Teaching
GG-15	Huélago-C Palaeontological Site	Huélago	Palaeontological	Regional		Teaching
GG-16	Mesa de Bacaire Glacis (glacis-horst)	Fonelas/Guadix/Villanueva de las Torres	Geomorphological	Regional		Geotourism/Education
GG-17	Tajos de la Carihuela	Diezma	Geomorphological	Regional	X	Scientific
GG-18	Belerda Fluvial System	Belerda (Guadix)	Stratigraphic	National		Geotourism/Teaching
GG-19	Fonelas Lacustrine Deposits	Fonelas	Sedimentological	National		Geotourism
GG-20	Travertines of Alicún Thermal Baths (Alicún de las Torres)	Villanueva de las Torres	Hydrogeological	National	X	Scientific/Geotourism/Historical
GG-21	Gorafe Angular Unconformity	Gorafe	Stratigraphic	National		Geotourism
GG-22	Alamedilla Upper Cretaceous-Eocene	Alamedilla	Stratigraphic	National		Geotourism/Docencia
GG-23	Alamedilla Pillow Lavas	Alamedilla	Petrological-Geochemical	International		Scientific/Geotourism
GG-24	Sierra de Guillimona Karst	Puebla de Don Fadrique	Geomorphological	National	X	Teaching/Geotourism
GG-25	River Gor Valley (rotational slips in Gorafe)	Gorafe	Geomorphological	National		Teaching/Geotourism
GG-26	Loma de la Solana-Peñón de Alamedilla	Alamedilla	Geomorphological	Regional		Teaching/Cultural
GG-27	Cerro de La Lancha (Dehesas de Guadix)	Dehesas de Guadix	Stratigraphic	International	X	Scientific/Teaching/Geotourism
GG-28	Gilbert-type Delta of Los Olivillos (Alicún de Ortega)	Alicún de Ortega	Stratigraphic	International	X	Scientific/Teaching/Geotourism
GG-29	Cúllar Seismites	Cúllar	Stratigraphic	Regional		Teaching
GG-30	Villanueva de las Torres Marine Calcarenites	Villanueva de las Torres	Stratigraphic	Regional		Teaching/Geotourism
GG-31	Limestone Formation of Puebla de Don Fadrique	Puebla de Don Fadrique	Geomorphological	National		Geotourism
GG-32	Cortijo de Victoriano Bentonites	Villanueva de las Torres	Sedimentological	Regional		Geotourism/Teaching
GG-33	Zújar Fluvial-Lacustrine Deposits	Zújar	Sedimentological	Regional		Teaching
GG-34	(C. del Campo) Sierra de La Sagra	Huéscar/Puebla de don Fadrique	Tectonic, Geomorphological and Stratigraphic	Regional		Geotourism
GG-35	Cerro Méndez Jurassic Series (Alamedilla)	Alamedilla	Stratigraphic	National		Teaching
GG-36	Alcaide Ravine (Alamedilla)	Alamedilla	Petrological-Geochemical	International		Teaching
GG-37	Alicún de Ortega Volcanic-Sedimentary Series	Alicún de Ortega	Petrological-Geochemical	Regional		Teaching
GG-38	Graena Thermal Spring	Baza	Hydrogeological	Regional		Geotourism
GG-39	Contact between the Guadix and Baza Formations	Baza	Stratigraphic	Regional		Teaching
GG-40	Guadiana Menor Triassic	Negratín (Freila)	Stratigraphic	Regional		Teaching

GG-41	Negratín Marine-Continental Transition	Negratín (Freila)	Stratigraphic	Regional		Teaching
GG-42	Travertines of Zújar Thermal Baths	Zújar	Hydrogeological	Regional		Teaching
GG-43	Baza-1 Palaeontological Site (Las Seguidillas Ravine)	Baza	Palaeontological	National	X	Scientific/Geotourism
GG-44	Benalúa Badlands (Cerro Kabila Viewpoint)	Benalúa	Geomorphological	Regional		Geotourism
GG-45	Castril Sand Cave	Castril	Sedimentological and Historical Heritage	Regional		Teaching
GG-46	Barchel or Bácor Salt Flats (Cortijo de las Salinas)	Dehesas de Guadix	Hydrogeological	Regional		Teaching
GG-47	Tollo de Chiclana Palaeontological Complex	Gorafe-Negratín (Freila)	Palaeontological (micromammals)	International	X	Scientific/Teaching
GG-48	El Tollo Doline	Huéscar	Geomorphological	Regional		Geotourism
GG-49	Fuente Caldera Eocene-Oligocene Series	Pedro Martínez	Stratigraphic	National		Teaching
GG-50	Villanueva de las Torres Fluvial System	Villanueva de las Torres	Stratigraphic	Regional		Teaching
GG-51	Cerro Molicies Miocene Series	La Peza	Stratigraphic	Regional	X	Geotourism/Teaching
GG-52	Guadiana Menor Badlands/Las Murallas	Gorafe	Geomorphological	Regional		Geotourism/Teaching
GG-53	Mesa de Bacaire Glacis (glacis-horst)	Cortes y Graena	Palaeontological	Regional		Scientific/Teaching
GG-54	Travertines and El Coto Cave	Huélago	Geomorphological	Regional		Geotourism/Teaching
GG-55	Benamaurel Sulphur Mines	Benamaurel	Minero-metallogenic	Regional		Geotourism/Teaching
GG-56	Benamaurel Gypsum Deposits	Benamaurel	Sedimentological	Regional		Scientific/Historical
GG-57	Cúllar-Baza-1 Palaeontological Site	Cúllar	Palaeontological	International		Scientific
GG-58	Castilléjar and Galera Badlands	Castillejar y Galera	Geomorphological	Regional	X	Scientific/Teaching/Geotourism
GG-59	Castilléjar Gypsum Deposits (Los Amos Cave)	Castillejar	Sedimentological	International	X	Scientific/Teaching/Geotourism
GG-60	Galera Gypsum Deposits	Galera	Sedimentological	National		Scientific/Teaching/Geotourism
GG-61	Venta Micena Palaeontological Site	Orce	Palaeontological	International	X	Scientific/Teaching/Geotourism
GG-62	Barranco León-5 Palaeontological Site	Orce	Palaeontological	International	X	Scientific/Teaching/Geotourism
GG-63	Fuente Nueva-3 Palaeontological Site	Orce	Palaeontological	International	X	Scientific/Teaching/Geotourism
GG-64	Barranco de las Cañadas, Barranco de las Quebradas, Cortijo de la Calahorra Palaeontological Complex	Huéscar	Palaeontological	International		Scientific/Teaching
GG-65	Peña de Castril and Narrowing of the River CastrilBadlands (piping)	Castril	Geomorphological	Regional		Geotourism/Cultural
GG-66	Castellón Alto Gypsum Mine	Galera	Petrological-Geochemical	Regional		Geotourism/Teaching
GG-67	Bugéjar Endorheic Basin/Lake	Puebla de Don Fadrique	Geomorphological	Regional		Geotourism/Cultural
GG-68	Rambla de los Pilares	Galera	Stratigraphic	International	X	Scientific/Teaching/Geotourism
GG-69	Galera SeismitesCascaborras Gorge-Lobo Pass-Duarte Ravine	Galera	Stratigraphic	International	X	Scientific/Teaching/Geotourism
GG-70	Baza Fault (Gallego Ravine)	Baza	Tectonic	International	X	Scientific/Teaching/Geotourism
GG-71	Ferreira Fault (Mecina Extensional Décollement in the Cerro del Cardal)	Ferrerira	Tectonic	International		Scientific/Teaching
GG-72	Source and Valley of the River Guardal	Huéscar	Geomorphological/Stratigraphic	Regional	X	Scientific/Teaching/Geotourism

Fig. B. 5 | Panoramic view of a level of palaeoseismites in sediments from the Lower Pleistocene (Galera) *©Francisco Juan García Tortosa, Alberto Tauste*

Fig. B. 6 | Gullied landscape in Fonelas *©EPVFR-IGME*

Fig. B. 7 | Outcrop of basic volcanic rocks with pillow lava structures surrounded by pelagic marine marly materials from the Cretaceous Period ©Alberto Tauste

Fig. B. 8 | Upstream of the Negratín reservoir a spectacular gullied landscape can be identified carved in Upper Miocene marine rocks *©EPVFR-IGME*

Fig. B. 9 | The Fonelas P-1 palaeontological deposit, dating from 2 million years ago (magnetostratigraphy and biostratigraphy), corresponds to the sedimentation on a floodplain of an oxbow lake in a fluvial system *©EPVFR-IGME*

Fig. B. 10 | In the Cañada Gallego (Gallego ravine) there is one of the best outcrops of the active Baza Fault, whose surface course is close to 37 km long. Panoramic view of the Baza Fault in Cañada Gallego (Baza) *©Francisco Juan García Tortosa*

Fig. B. 6

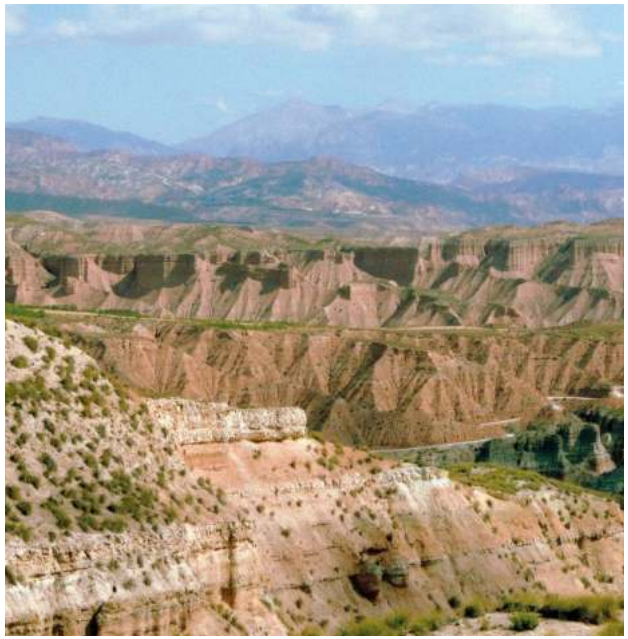


Fig. B. 7

Fig. B. 8

Fig. B. 9

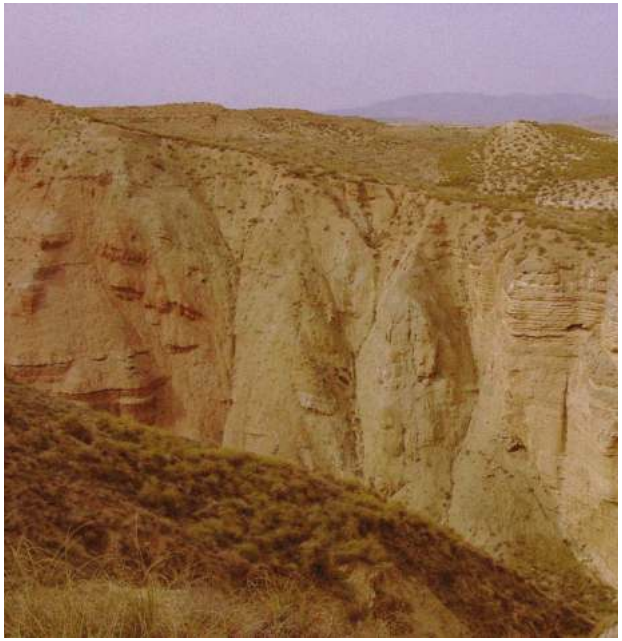


Fig. B. 10

B5. CONSERVATION OF GEOLOGICAL HERITAGE

The management of geological heritage in the Granada Geopark is clearly geared towards the preservation of its important resources, proposing measures for the improvement, maintenance and appropriate use of the sites of geological interest it contains.

This management aims to facilitate the scientific study of those resources, making it compatible with their observation and enjoyment by tourists and minimizing the degradation inherent in the influx of visitors.

For this purpose, a series of **recommendations for use** are made aimed at residents and/or those interested in visiting the Granada Geopark, with the intention of raising awareness of the importance of caring for our heritage to ensure that it can be enjoyed by future generations.

These recommendations are no different from those established in general terms by current legislation, regardless of whether they refer to a Geopark.

The conservation of geodiversity and geological heritage are covered by national, regional and provincial legislation. In the case of the Geopark, it needs to be emphasised that **there are various legal instruments covering protection of this area.**

In any case, the Granada Geopark is working on implementing other measures, at a local level, for the most representative sites, such as signposting with recommendations for use at the sites of geological interest most at risk of alteration and damage, or formulating subsidiary regulations for conservation and local use of those sites.

B5.1. Recommendations for conservation of the Granada Geopark

The Granada Geopark has drawn up a series of recommendations suitable for ensuring visits full of interest for responsible visitors with empathy for the environment and the need to preserve it, and this has led to the introduction of basic instructions on the information panels distributed throughout the territory.

In general it is recommended that those visiting these sites should always follow the existing routes and not stray off them.

The Granada Geopark's strategy includes provision for carrying out studies that will enable it, on the one hand, to identify the degree of anthropic degradation that may affect a particular site of geological interest, and on the other, to define the carrying capacity of the immediate environment of those of greatest tourist interest. The ultimate aim of these studies is to determine the appropriate number of visitors in a given period of time for each of the sites of geological interest analysed, as well as to **determine the limit at which the exploitation of a resource becomes unsustainable and harmful,** for the site itself or for its environment.

These studies will make it possible, at each site of geological interest, to indicate, in the most appropriate and precise way, the recommendations for its use, as well as to design routes and facilities that allow **enjoyment of the site to be reconciled with its preservation.**

Many of the sites of geological interest in the Granada Geopark are based on geomorphology, including all those whose main element is the shaping of badlands. For this reason, Granada Geopark's strategy has from the beginning been warning of the importance of preserving the landscape.

Within the geoconservation recommendations, the Granada Geopark specifies which are its sites of geological interest whose main interest is scientific and/or educational, redirecting their use solely for a specialised audience or for teaching purposes.

Recommendations for all those interested in visiting the Granada Geopark:

- **This region has an extreme climate.** In winter, wrap up well, and in summer, bring water, a hat and light clothing and avoid exertion in the middle hours of the day.
- **Respect private property.** Do not disturb livestock or damage crops or fruit trees.
- **Badlands contain concealed hazards.** Always follow signposted paths or routes when visiting them.
- **Tours in vehicles must only be done on roads.** Do not damage the Geopark with your motorcycle or SUV/off-road vehicle.
- **Collecting remains from archaeological or palaeontological sites is a criminal offence and our fauna and flora include many endangered species.** Do not gather plants, fossils or minerals or capture animals: photograph them. If you want to know what it is, send the photo to the Geopark: you will be provided with information and it will help us to learn more about our natural environment.

Conservation icons referring to the recommendations for visiting the GG

In general, management of the sites of geological interest in the Granada Geopark will be directed towards preserving the geological heritage, by analysing, studying and proposing measures for improvement, maintenance and use so that they can be observed and enjoyed, minimizing the degradation inherent in the influx of visitors.

B5.2. Main threats in the Granada Geopark

B5.2.1. Threats over time

Natural threats

Some of the sites of geological interest in the Granada Geopark could be threatened by erosion, although that erosion has also unearthed and revealed most of the sites of geological interest. Therefore, except in specific cases, it is not a cause for concern from the point of view of loss of geological heritage.

Current and potential threats of anthropogenic origin

At the territorial level there are several threats that could affect the conservation and protection of the geological, natural or scenic heritage of the area.

Looting or plundering of archaeological and palaeontological sites is one of the threats that must be highlighted. The root cause is the trade in objects obtained from looting of unique sites, resulting in the practice of **criminal activities** with a very adverse impact on the Geopark's heritage. National and regional legislation already protects and defends Spanish heritage against export and looting *(Law 16/1985 on Spanish Historical Heritage and Law 14/2007 on Andalusian Historical Heritage).* In addition, the law expressly regulates the destruction of archaeological and palaeontological remains, as well as that of sites that entail an irreparable loss of information (Article 109 n), in response to illegal excavations.

Furthermore, carrying out **unregulated tourism and leisure activities in sensitive areas** that may, by their nature, be irreversibly damaged (the use of four-wheel drive vehicles off rural roads, for example) must be avoided. It is important to emphasise that respectful behaviour and sensitivity to preserving this natural heritage will enable the tourism activities carried out in the territory to be regarded as a great tourist attraction for all those who want to visit the Geopark.

The creation of infrastructure in the area, such as new power lines, photovoltaic, thermosolar or wind energy production facilities, dam construction projects or transport infrastructure are projects that may stimulate the development of the Geopark but that must, in turn, guarantee respect for its natural heritage. They must therefore be subjected to a thorough prior study owing to their potential effect on particularly vulnerable resources and/or the severe impacts on the landscape that they entail.

Earth levelling and excavation works for construction and/or expansion of farmland must be carried out adopting the necessary measures so that the new plantations fit into the Geopark without threatening resources of special importance.

Similarly, **artificial erosion processes resulting from ploughing and terracing for agricultural purposes or for reforestation** – especially in areas outside the natural distribution of the species – with the use of inappropriate planting systems (terracing) also represents a risk to the conservation of the Geopark due to the heavy artificial erosion processes they give rise to.

Overexploitation of aquifers, mainly caused by farming activities, represents another threat. Specifically, the one that supplies the Alicún spa may disrupt the continuity or functionality of the travertine system.

The introduction of **extractive and industrial activities** in the area, such as mining and quarrying operations, that could affect some site of geological interest would be an unacceptable risk, because non-renewable resources are involved, in addition to the substantial impact on the landscape that they entail.

However, one of the problems that is having the greatest effect on the territory of the Geopark is the **processes of depopulation and ageing of the population,** which have adverse repercussions not only for the loss of traditions and customs, but also for conservation and abandonment of the area's resources. Avoiding these processes is therefore a basic objective to ensure the development of the territory and the conservation of a heritage that makes it unique.

MAIN THREATS IN THE GRANADA GEOPARK

- **Erosion** caused by natural phenomena
- **Looting and plundering** of palaeontological and archaeological remains
- **Uncontrolled tourism** and leisure activities
- Creation of **human infrastructure**
- **Artificial erosion** for agricultural and forestry purposes
- **Overexploitation of aquifers**
- **Industrial and extractive activities**
- **Depopulation** and ageing of the population

C

OTHER HERITAGE

C1. NATURAL HERITAGE OF THE GRANADA GEOPARK

C1.1. Evolution of the steppe landscape in the Geopark

The Granada Geopark is situated in the centre of the largest and most extensive **high steppe plateau** in Andalusia. This is a landscape that as well as having existed spontaneously in greater or lesser expanses throughout the evolutionary history of the Mediterranean basin, constituting one of the most primitive elements of the landscape of the Iberian Peninsula, maintains a uniqueness and biodiversity that make it a landscape of great importance from the scientific and environmental point of view.

Suitable climatic conditions for the establishment of steppe ecosystems in Andalusia probably did not appear until quite late in the Tertiary (about 20 million years ago), when hot, humid tropical conditions predominated; these began to change when Africa and Europe moved closer together and the Mediterranean (then the Tethys Ocean) was closed by what is now the area of the Strait of Gibraltar.

These events led to a **loss of marine influence,** which gradually made the climate drier and cooler in the Mediterranean region. The closing of the Tethys Ocean led to the so-called Messinian salinity crisis (starting about 6.5 million years ago, at the end of the Tertiary), which entailed a massive accumulation of salt on the seabed and probably included a period of almost complete desiccation which transformed this sea into a series of large lakes.

All this laid the environmental foundations for the formation of the first steppes, while favouring the influx and propagation of steppe species from North Africa and the southern Eurasian steppes. This is the reason why we find very curious species related to or shared with those territories.

But after the Messinian, steppe ecosystems were reduced and went through delicate subsistence problems with the gradual cooling which led to the Quaternary glaciations. And once the climate began to improve, after the last glaciation, these ecosystems were associated, mainly, with saline or gypsiferous areas, while the forests occupied the land where the soils were more favourable.

The result is the present rugged landscape, which speaks to us of the natural events that occurred during the geological history of this exceptional environment.

C1.2. Gypsum and salt: geology determines floristic significance

The steppe landscape, of which the Geopark is part, contains a large number of ecological environments within a semiarid general context. For that reason, and because of the past events already described, it has many species of its own with very localised populations. It accommodates a mosaic of plains, gullies or badlands and watercourses, essentially, into which elements such as isolated limestone hills are incorporated (notably including the Cerro de Jabalcón) or the rivers themselves, which in this arid setting constitute veritable islands for flora.

Semi-desert is the most characteristic habitat of the Geopark and is populated by esparto grasses, albardines and various scrub species *(Retama sphaerocarpa, Genista scorpius, Genista pumila, Astragalus clusianus, Rosmarinus officinalis o Salvia rosmarinus, Salsola oppositifolia, Salsola vermiculata, Atriplex halimus, Hammada articulata, Suaeda vera, Helianthemum almeriense, Helianthemum syriacum, Ephedra fragilis, Rhamnus lycioides).*

A variant of these habitats is found on the gypsum beds of the Hoya de Baza (Baza depression) or the Triassic ones in the Hoya de Guadix (Guadix depression), where there is a predominance of esparto grasses and gypsophilous-halophilous shrubs *(Gypsophila tomentosa, Gypsophila struthium, Ononis tridentata, Suaeda vera, Arthrocnemum macrostachyum).* But it is the saline outcrops, salt marshes and gypsiferous substrates that provide numerous unique species, adapted to these special conditions linked to the type of substrate, and that form the saline steppes and gypsophilous (gypsum-loving) vegetation, constituting habitats of priority interest for the European Union. The origin of the most important gypsum outcrop in the Geopark, situated in the Hoya de Baza, is evaporitic; it was formed in a saline continental lacustrine environment during the Plio-Pleistocene, that is, in a former lake that occupied much of the Geopark, and probably in a semiarid context. These gypsums are intercalated with shales and other carbonate materials, even with native sulphur formations.

Other communities are found on carbonate conglomerates and rocky substrates, which create favourable conditions for the establishment of the only natural forests in the Geopark, formed by Aleppo pines *(Pinus halepensis)* accompanied by cade junipers *(Juniperus oxycedrus),* kermes oaks *(Quercus coccifera)* and more occasionally by Spanish and Phoenician junipers *(Juniperus thurifera, Juniperus phoenicea)* and holm oaks *(Quercus rotundifolia).* The pine forests have been artificially extended by reforestation, altering semi-desert areas.

Finally, on the alluvial plains there are various formations of riparian vegetation. Fig. C. 1

In short, the strictly Iberian flora and fauna that the Geopark contains are unique, at least in the European context, and are therefore one of Andalusia's and Spain's main contributions to biodiversity in the European Union.

Fig. C.1 | The only natural forests in the Geopark grow on the limestone conglomerates and rocky substrata, dominated by Aleppo pines (Cañón de Arroyo de Baúl)
@José Antonio Garrido

Fig. C. 2 | General appearance of the semi-desert vegetation that grows on the gypsiferous marls of the Baza depression (Barranco del Espartal, Hoya de Baza) *@José Antonio Garrido*

C1.3. Distinctive nature and importance of the Geopark's fauna

Outstanding among the distinctive fauna of the high steppe plateau where the Geopark is located are the **steppe birds,** which constitute a unique combination of Asian and North African faunal elements, with morphological, physiological, ethological and ecological adaptations that enable them to occupy these particular environments.

Many of them are life forms that evolved in arid environments, corresponding to speciation groups in the neighbouring African continent, and are therefore highly unusual, biologically and ecologically, in the European context. This originality is added to the conservation value of some of these species, which, in the case of flora, represent an **exclusive contribution of Spain and Andalusia to biodiversity in the European Union.**

Sub-desert steppes such as that which predominates in the Geopark have climatic, geological and edaphological characteristics that give rise to substantial temporal and spatial variability in biological communities, particularly flora, as we have explained, but also in invertebrates and birds, mainly those linked to the well-preserved systems of gypsiferous watercourses.

The fauna has been the subject of numerous studies (for a summary, see Megías et al., 2011; Valera et al., 2011).

A great variety of insects live in the semi-desert, foremost among which, for their ecological importance, are beetles of the Tenebrionidae, Meloidae, Escarabeidae and Chrysomelidae families, ants, grasshoppers and butterflies, with more than 200 species recorded among the nocturnal ones and locations where at least 30 diurnal species coexist.

A**mong the vertebrates, those associated with rocky places are particularly interesting** (Iberian ibexes, the densest European populations of red-billed choughs and black wheatears, very significant populations of golden eagles, Bonelli's eagles, peregrine falcons, eagle owls and jackdaws, and a growing presence of griffon vultures). Aside from the cliffs and ledges, semi-deserts are breeding and feeding areas for major populations of **larks** (crested and Thekla larks, greater and Mediterranean short-toed larks,

calandra larks), rollers, western black-eared wheatears, corn buntings, European bee-eaters, red-legged partridges and trumpeter finches.

Moreover, semi-deserts are a very important component of the environmental machinery that enables birds to survive on a regional scale, as they constitute a winter refuge for species that breed in the nearby mountains, such as the black redstart, the chiffchaff and the Eurasian skylark. As a whole, these rich communities of birds have led much of the Geopark to be regarded as an Important Bird Area at national and European level (Infante et al., 2011).

Part of the Geopark includes mountainous areas, covered with repopulated pine forests and remains of holm-oak and Portuguese-oak woods, and another contains an extensive glacis, which is highly humanised but still retains some cultivated pastures with scattered holm oaks. However, the most important biotic elements are concentrated in the **valleys in the interior of the basin.**

The current biodiversity of these valleys is strongly conditioned both by the semiarid and continental nature of their climate and by historical processes and geographical factors. These have fostered a very intense relationship with Northwest Africa and, at a regional level, with Mediterranean and riparian forests or mountain habitats of the surrounding sierras, or with the semi-deserts of Almería. Fig. C. 2

These river valleys provide entry to the territory for animals typical of the woodland present in the surrounding sierras (forest birds, wild boars, genets), from aquatic environments (aquatic birds and invertebrates, fish, amphibians, otters, Mediterranean water shrews) and wet meadows (water voles, Cabrera's voles), or food for species that take refuge in the nearby gullies (badgers, foxes, martens, and several species of bats).

Finally, there are areas where **rabbits** are still abundant, facilitating the presence of specialised predators such as wildcats, or Iberian lynxes, which lived in the area until the 1970s and are currently being seen again occasionally. Fig. C. 3

Fig. C. 3 | The rivers and associated irrigation systems facilitate the presence of aquatic fauna in the Geopark, such as moorhens *(Gallinula chloropus)* @José Antonio Garrido

C1.4. Unique species and important habitats in the Geopark

The ecological conditions in the Granada Geopark have fostered a very rich biota (at least 1,500 animal species and 1,129 species of flora; Cueto et al., 2014; Garrido-García, in prep.), including numerous **species that are exclusive** or almost exclusive to the Geopark, such as the plant *Centaurea saxifraga* or the snail *Helicella zujarensis* (exclusive to the Cerro de Jabalcón), the plant *Limonium alicunense* (which lives only in the area around the Alicún spa), the plants *Sonchus crassifolius* and *Limonium majus,* the moth *Heterogynis andalusica* and the butterfly *Euchloe bazae* (restricted to the saline habitats of the Hoya de Baza) and the plant *Arenaria arcuatociliata* (more widely distributed around the depressions) (Ruiz et al., 2009; De la Cruz Pardo et al., 2010; Blanca et al., 2011; Garrido-García, 2016). Fig. C. 4

It also comprises **seriously threatened species** which, after becoming extinct in the rest of their range, have their last refuges in this territory (e.g., the snail *Orculella aragonica* and the plant *Clypeola eriocarpa).*

In addition, **it serves as a habitat for numerous endangered and critically endangered species.**

As well as those already mentioned, the Geopark contains part of the last populations of the plants *L. majus, C. eriocarpa, C. saxifraga, Astragalus oxyglottis, Carum foetidum, Cochlearia glastifolia, Erodium cazorlanum, Haplophyllum bastetanum, Limonium minus, Plantago maritima, Senecio auricula* and *Vella pseudocytisus,* the snail *O. aragonica o Kretania Hesperica,* the crayfish *Austropotamobius pallipes,* the butterfly *Plebejus pylaon* and the mayfly *Torleya nazarita* (De la Cruz Pardo et al., 2010). Fig. C. 5

The area shows very diverse plant cover, including **30 habitats included in the Habitats Directive 92/43/EEC,** among which are some of the best European representations of Iberian gypsum vegetation (habitat 1520) and of halo-nitrophilous scrubs (habitat 1430) (De la Cruz Pardo et al., 2010).

All this natural heritage is evaluated and interpreted through the **Geopark's educational programme,** as well as through other resources present in the territory (mu-

Fig. C. 4 | The antlion Nemoptera bipennis is very common in the western half of the Geopark *@José Antonio Garrido*

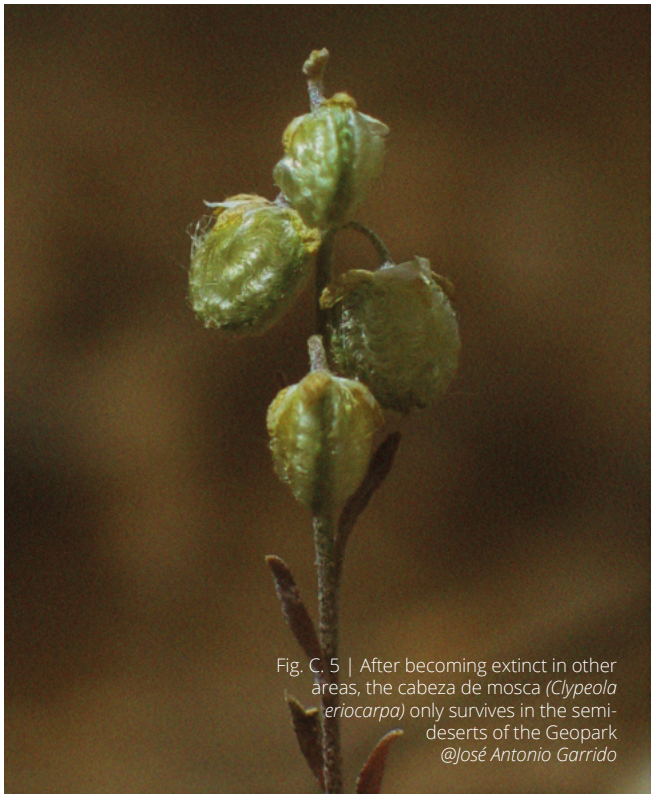


Fig. C. 5 | After becoming extinct in other areas, the cabeza de mosca *(Clypeola eriocarpa)* only survives in the semi-deserts of the Geopark *@José Antonio Garrido*

terpretation centres, etc.), which are responsible for the investigation, conservation, teaching and dissemination of this interesting and rich heritage.

The resources available to the Granada Geopark for the enhancement and conservation of its natural heritage are:

- **The various institutions and entities (public and private)** that form part of the Granada Geopark Coordination Committee. Actions are conducted according to the competences and budgets of each institution, through criteria of complementarity and detected synergies.
- It is essential to highlight the importance of the **Andalusian Integrated Geodiversity Management Strategy,** with the development of initiatives whose object is to inventory, evaluate, protect and manage the geodiversity and geological heritage of Andalusia.
- Equally important is **the purchase by the IGME of the 25-hectare property containing the Fonelas P-1 deposit** and its immediate geological context for scientific exploitation and management of its heritage values.
- The territory has the **Spanish Nature Protection Service (SEPRONA)** as a public security body of the Spanish central government with 12 agents in the territory specifically devoted to the conservation of nature and the environment, water resources and hunting, fishing and forest assets.
- In addition, there are **29 environment agents of the Regional Government of Andalusia,** whose mission is the protection and surveillance of the natural and environmental heritage. Finally, at local government level, there are 6 municipal environment officers, with the task of achieving sustainable development in the municipalities of the Geopark and an appropriate quality of life for their residents.

C1.5. Sites of natural interest

Fig. C. 6 | Table of sites of natural interest

SITES OF NATURAL INTEREST	DESCRIPTION	NEARBY SITES OF GEOLOGICAL INTEREST
Flora		
EU Habitats of Priority Interest – 1520 Iberian Gypsum Vegetation *(Gypsophiletalia)*	Both are outstanding for their uniqueness in the European context and contain exclusive plant formations that are rare both at local level and in Iberia as a whole	Practically all, except those located in the centre of the Geopark
EU Habitats of Priority Interest – 1510 Mediterranean Salt Steppes *(Limonietalia)*		Practically all those located in the eastern half of the Geopark
Inventory of Wetlands of Andalusia – Salt Marshes of El Margen	Very important for the plant and animal communities it contains	GG-58
Inventory of Wetlands of Andalusia – Barranco del Agua in Galera		GG-59 GG-60 GG-66 GG-68 GG-69
Fauna		
Important Areas for Mammals (ZIM) ZIM 130: Andalusian Prebaetic Ranges	Important areas for the conservation of mammals in Spain proposed by the Spanish Society for the Conservation and Study of Mammals (SECEM)	GG-65
ZIM 146 Sierra Nevada-Sierra Arana		GG01; GG-12; GG-51; GG-53; GG-65
ZIM 148: Hoya de Guadix		Todos los de la cuenca del rio Fardes salvo GG01, GG38 y GG-51
ZIM 149: Rivers of the Hoya de Baza		GG-39; GG-42; GG-55; GG-56; GG-59; GG-60; GG-62; GG-63; GG-64; GG-65; GG-66; GG-68; GG-69; GG-70
ZIM 150: Sierra de Baza and Sierra de los Filabres		GG-43
Important Bird áreas IBA 211: Puebla de Don Fadrique-Las Cañadas	Important areas for the conservation of birds in Spain and Europe, proposed by the Spanish Ornithology Society (SEO) and BirdLife International	GG-61; GG-62; GG-63; GG-64; GG-67
IBA 213: Hoya de Baza		GG-42; GG-55; GG-56; GG-57; GG-58; GG-59; GG-60; GG-66; GG-68; GG-69; GG-70
IBA 214: Hoya de Guadix		All those of the River Fardes basin except GG-01, GG-38 and GG-51

IBA 222: Sierra Nevada		GG-01; GG-38; GG-51; GG-53
IBA 453: Llanos de la Calahorra-Valle del Zalabí		---
Areas of Importance for Steppe Birds of Andalusia (ZIAE): 17: Hoya de Guadix	Conservation Programme for Steppe Birds of Andalusia These are extremely important for their size and for the variety and uniqueness of the steppe birds living there	GG-02; GG-04; GG-05; GG-11; GG-13; GG-16; GG-19; GG-20; GG-21; GG-25; GG-31; GG-32; GG-40; GG-41; GG-45; GG-46; GG-47
18: Hoya de Baza		GG-42; GG-55; GG-56; GG-58; GG-60; GG-66; GG-68; GG-69GG-70
19: Cañadas – Los Llanos		GCVNG-64; GCVNG-67
Important Area for the Conservation of Invertebrates of Andalusia (ZICI): Area 2: Sierra de Orce y María	Programme of Actions for the Conservation of Endangered Invertebrates in Andalusia. Very important for the variety and uniqueness of the insects living there	GG-58, GG-60, GG-61, GG-62, GG-63, GG-66, GG-68, GG-69
Important Area for the Conservation of Invertebrates of Andalusia (ZICI): Area 3: Sierra de Cazorla, Las Villas and Sierras Norte de Granada		GG-64, GG-65, GG-66
Important Area for the Conservation of Invertebrates of Andalusia (ZICI): Area 4: Baza Depression		GG-42; GG-55; GG-56; GG-57; GG-58; GG-59; GG-60; GG-66; GG-68; GG-69; GG-70
Areas included in the European Unions' Natura 2000 Network Site of Community Importance ES6160015 "Río Guadiana Menor-upper section"	Occupies a prominent place in the Natura 2000 Network of Andalusia due to its special importance for the conservation of several species and habitats included in the annexes of the Habitats Directive (1992/43/EEC)	GG-05; GG-13; GG-40; GG-41; GG-46; GG-47
Site of Community Importance ES1640006 *Sierra de Arana*		GG-12; GG-18
Site of Community Importance ES6140010 *Sierra de Baza Norte*		GG-43
Site of Community Importance ES1640002 *Sierras de Cazorla, Segura y Las Villas*		GG-65
Special Conservation Area ES6140005 *Sierra del Nordeste (Sierra de la Sagra)*		GG-64, GG-65, GG-67

Special Conservation Area ES6140005 *Sierra del Nordeste (Sierra de la Sagra)*	Occupies a prominent place in the Natura 2000 Network of Andalusia due to its importance for conservation of holm oak woods, forests, deciduous trees, high mountain pine forests, pastures and riparian and rupicolous plant formations. Outstanding as a potential conservation area for the indigenous crayfish, the presence of numerous Lepidoptera of interest, carrion birds, endemic amphibians, and bats	GG-64, GG-65, GG-67
Inventory of Wetlands of Andalusia – Tailwaters of the Negratín Reservoir		GG-07 GG-39; GG-42 GG-55; GG-70
Landscape		
Outstanding landscapes	**Special Physical Environment Protection Plan (PEPMF) of the Province of Granada With legal protection**	
PS-3 (Area around the Alicún de Ortega Spa)	These are spaces with landscape of recognised uniqueness and act as visual transmitters or receivers of great aesthetic interest	GG06; GG09; GG-17; GG-20; GG-21; GG-32
PS-4 (Gorafe Gorge)		GG-04; GG-25
PS-5 (Mencal)		GG-06; GG-09; GG-14; GG-17
PS-6 (Cerro de Jabalcón)		GG-07; GG-39; GG-42 GG-70
PS-7 (Badlands of Bacor Olivar)		GG-04; GG-05; GG-13; GG-20; GG-21; GG-25; GG-30; GG-31; GG-40; GG-41; GG-46; GG-47; GG-50; GG-52
PS-10 (Badlands of La Estación de Guadix)		--
Mountain Complexes of Environmental Interest	**Special Physical Environment Protection Plan (PEPMF) of the Province of Granada With legal protection**	
CS-5 (Sierra Nevada)		GG-5
CS-9 (Sierra Arana and Sierra de Cogollos)		GG-12
CS10 (Sierra de Baza)		GG-43
CS-11 (Sierra de Orce and Sierra de Periate)		---

CS10 (Sierra de Baza)	Large mountain areas of regional scenic interest, essential for the conservation of biodiversity and for water supply to towns and villages and cultivation	GG-43
CS-9 (Sierra Arana and Sierra de Cogollos)		---
CS12: (Sierras del Nordeste)		GG-65
CS13 (Sierra del Madroñal)		---
Unique agricultural landscapes	**Special Physical Environment Protection Plan (PEPMF) of the Province of Granada**	
AG-4 (Vegas de la Hoya de Guadix)	These are representative areas of traditional agrarian landscape of outstanding natural beauty	GG-01; GG-18, GG-19; GG-38; GG44; GG45; GG48; GG-53
AG-6 (Vega de Gor)		---
AG-7 (Vega de Zújar)		GG-33
AG-8 (Vega de Huéscar, Vega de Castril and Vega del Guardal)		GG-39; GG-42; GG-55; GG-56; GG-59; GG-60; GG-62; GG-63; GG-64; GG-65; GG-66; GG-68; GG-69; GG-70
AG-9 (Puebla de Don Fadrique Depression)		---
Network of protected natural spaces of Andalusia	**Areas considered Natural Monuments for their scenic importance**	
Badlands of El Marchal		GG-01; GG-38; GG-65
Peña de Castríl	**Network of Protected Natural Spaces of Andalusia (RENPA) Special protection areas**	
Badlands of El Marchal	These are natural spaces or elements basically comprising formations of recognised uniqueness, rarity or beauty that deserve to be subject to special protection	GG-01 GG-38 GG-51 GG-53
Peña de Castríl		GG-65

C2. CULTURAL HERITAGE OF THE GRANADA GEOPARK

The uniqueness of the palaeontological deposits, from ancient and recent prehistoric eras, the diversity and complementarity with the heritage of defensive and cave-dwelling architecture, and the palaeogeographic and landscape diversity values make the territory an area of exceptional cultural value.

C2.1. History and culture

The unique physical conditions of the territory have influenced its history, with successive processes of occupation and organisation from prehistoric times to the present day. These special physical and geological conditions endow the Geopark with exceptional heritage value, in which the archaeological and palaeontological sites prove to be key to understanding the processes of human occupation on the European continent.

The strong personality of the groups that inhabited these lands, manifested in a clear sense of the existence of life after death, is projected in the **megalithic groups of Gor and Gorafe.** Similarly, the sites of Cerro de la Virgen (Orce), El Malagón (Cúllar) and Castellón Alto (Galera) bear witness to the presence of communities, established during the Copper or Bronze Age, located in characteristic high-lying settlements, arranged with an incipient form of urban planning. More recent prehistory is marked by the presence of the **Argaric culture in the southeast of the Peninsula.** The beginning of the orientalisation of these lands is expressed, in turn, in the **Iberian necropolis of Tutugi,** where the cult of death is monumentalised, and at the **Cerro del Santuario (Baza),** where the finding of female funerary cult images at each reaffirms that close relationship with the territory, from a clear symbolic perspective with a strong magical/religious component.

In the Roman period the historian Livy provides information on **Bastetania,** whose eponymous city would have been Basti, located at Cerro Cepero.

This region was divided into various spaces under the direct authority of each of the oppida (towns) – Tutugi (Galera), Arkilakis (Puebla de Don Fadrique), El Forruchu (Villanueva de las Torres), Basti (Baza) and Acci (Guadix) – which functioned as micro-states in which all activities related to the exploitation and management of resources were directly controlled by the aristocracy.

The period of **territorial expansion through mechanisms of agricultural colonisation** took place successively in the fourth century BC, with fortifications – Las Angosturas in Gor, the Cerro de los Almendros and Fuente Amarga in Huéscar and Los Castellones in Laborcillas – and **exploitation of the mining resources** in metalworking settlements such as La Calera in Dólar, El Cardal in Ferreira and the Peñón de Alrután in Jérez del Marquesado.

As a result of the Second Punic War, some centres disappeared, while others survived and allied themselves with the power of Rome. Later, the replacement of the Via Heraclea with the Via Augusta isolated the district of Huéscar from the commercial developments that led to the prosperity of its main enclaves, especially the **Colonia Iulia Gemella Acci.**

The transition from Antiquity to the Middle Ages is recorded by the testimonies of early Christianity, which was represented by the Bishop of Guadix at the Council of Elvira in the fourth century. From 711 onwards the **Muslim presence** left its indelible mark on settlements that have retained place names, physical appearances and traditions, the most characteristic feature being urban architecture. Fig. C. 7

The **alcazabas (citadels)** of Guadix and Baza were built at the central point of an area in which castles such as those of Bácor, Castril, Freila, Zújar, Aldeire and Lanteira and the series of **watchtowers** that mark out the territory, where it becomes most uneven, are now the clearest reflection of medieval territorial organisation.

At the end of the medieval period, the Catholic Monarchs, determined to put a permanent end to the Andalusi presence, intensified the incorporation of the districts of Huéscar, Baza and Guadix during the third phase of the **War of Granada,** between 1487 and 1489, the latter being the year of the fiercest campaign of the conflict. The Crown of Castile

HISTORY OF THE GRANADA GEOPARK

COPPER AND BRONZE AGES |
Megalithic groups in Gor and Gorafe
Argaric culture
Iberian necropolis of Tutugi
Cerro del Santuario in Baza

ROMAN ERA |
Bastetania
Territorial expansion through agriculture: Las Angosturas in Gor, the Cerro de los Almendros, etc.
Exploitation of mining resources: La Calera in Dólar, El Cardal in Ferreira, etc.
Colonia lulia Gemella Acci

MIDDLE AGES |
Christianity: Council of Elvira
Arrival of the Muslims in the Peninsula in 711
War of Granada: between the Andalusis and the Catholic Monarchs
Guadix as the institutional epicentre of the Crown of Castile
Morisco rebellion of 1568

MODERN ERA |
Modernisation: factories, rail infrastructure, farms and mining


Fig. C. 7


Fig. C. 8


Fig. C. 9

then established the main institutions of political, military and religious control in Guadix, through one of the most extensive areas of jurisdiction of a corregidor (royal magistrate) and the **restoration of the former episcopal see.**

These institutions were responsible for carrying out the policy of religious and cultural assimilation of the majority Morisco population, to the point of provoking the **rebellion of 1568,** with tragic consequences for these districts. The Church promoted a development of the arts at its service, making this region one of the richest dioceses in terms of artistic heritage.

Guadix Cathedral and the collegiate church of Baza, along with outstanding examples of late Gothic, Renaissance and Mudéjar religious architecture in the province, are the most obvious examples of its enormous wealth. Figs. C. 8 and C. 9

The eighteenth and nineteenth centuries saw some **attempts at modernisation,** as the lands being worked grew more extensive, and they are now silent witnesses of industrial complexes showing an attempt to revive. New factories, railway infrastructure and farming units, added to the existing ones, form a substantial industrial heritage, supplemented by the mining tradition, as one of the most exceptional values and the best-defined sign of collective identity.

These distinctive cultural features have given rise to various forms of **modern dwelling,** such as Moorish mountain houses, Castilian houses, farmhouses and caves, in a remarkably dense profusion of types and examples. But the plentiful range of constructions linked to the traditional agrarian economy, and others related to water culture, should not be forgotten. They are witnesses that have endured and reflect the different historical periods and the representative social, cultural and economic conditions of each one of them.

Fig. C. 7 | The Moorish Baths in Baza date from the thirteenth century (Almohad period) *@Provincial Tourist Board*

Fig. C. 8 | Guadix Cathedral *@Provincial Tourist Board*

Fig. C. 9 | Monastery of Santo Domingo. An outstanding example of a Mudéjar coffered ceiling *@Provincial Tourist Board*

C2.2. Cave dwelling and geology

The shaping of the cave-dwelling landscape over time

The existence of the gullied desert landscape, together with the presence of steep escarpments in materials such as clays and marls naturally intercalated with other harder ones (limestones or cemented conglomerates), all of them arrayed horizontally, is what has made possible the widespread **development of caves as dwellings** in this district.

The clayey and marly levels are very impermeable and easy to excavate, while the well-consolidated and cemented carbonate and conglomerate levels lend cohesion to the slopes, acting like natural foundations. So the local inhabitants have used the steep sides of the gullies to excavate their homes as an alternative to traditional construction, benefiting from a practically constant temperature all year round, in an extremely harsh climate due to its strong contrasts, with an annual temperature range of as much as 50 degrees Celsius. This is why they have continued to be used for centuries up to the present day.

The emergence of caves in this remarkable territory and their proliferation over the last thousand years cannot be understood without **the presence of a favourable geological setting and the coexistence of certain historical facts and social developments** that led the population to find the answer to their most basic needs in this particular form of habitat.

We have here a building tradition of North African populations who arrived in this area between the tenth and twelfth centuries. The ethnological and historical/archaeological studies carried out in this territory have highlighted the existence of these first artificial caves **(covarrones or Moors' caves,** as they are known in the area) which are older and whose characteristics, mode of construction and topographic layout differ markedly from Morisco and Castilian caves. All of them show traces of Medieval occupation and are notable for their defensive character and for the diversity of their functions: watchtowers, shelters, dwellings, granaries in cliff walls or dovecotes.

Most of these forms of habitat **were abandoned before the Christian conquest** and were apparently never reoccupied, not even by the Moriscos, although **many of the current cave villages developed in the surrounding areas or in their vicinity during the sixteenth century.**

This building phenomenon reached urban dimensions at the end of the sixteenth century, when the Moriscos expelled after the **rebellion of Aben Humeya** returned to their place of origin, in a kind of fugitives' return, and as they could not reclaim their former possessions they occupied the existing caves or excavated new ones.

From the seventeenth century, the resettlers arriving from other regions of the Peninsula, after the order of definitive **expulsion of the Moriscos** issued by Philip III, also used them as homes, constituting the seed of the cave neighbourhoods and the cave houses of today (an evolution from the former).

The other great moment of expansion of caves occurred in the province of Granada at the end of the nineteenth century and in the first half of the twentieth, coinciding with periods of population growth, immigration and bringing of new land under cultivation. The important **sugar and agricultural industries** in the territory acted as a major focus of attraction for a population of humble social and economic origins, looking for cheap housing suited both to their traditional way of life and to their space needs (yards, stables, silos, etc.).

With this population and its successive inhabitants, this age-old example of subterranean architecture evolved formally and some of its more traditional aspects were modified, with a view to making it more comfortable and practical.

Over the course of the twentieth century, the facilities and services that had been introduced into conventional dwellings a few years before were gradually incorporated into cave houses.

So it was that over time a **cave-dwelling landscape of worldwide significance** took shape, strongly characterizing the territory of the Geopark, with a real example of sustainable bioclimatic housing that offers an interesting experience to the twenty-first-century ecotourist. Fig. C. 10

Fig. C. 10 |
Cuevas del Cenete
@Alberto Tauste

C2.3. Archaeology in the Geopark

The presence of humans in Orce more than a million years ago is corroborated by the finding of a **human tooth and lithic industries** associated with fossil remains of many other mammals.

Taking a huge leap forward in time, the **cave art** that appears in the vicinity of the Geopark territory has been attributed to Neolithic groups, of whose settlements the oldest remains correspond to widely scattered huts that are evidence of a very small population. By the Copper Age this population had already become truly sedentary, with a settlement that was organised around the river valleys and had grown enormously, intensifying its exploitation of farming and mining resources. From this period, in the eastern part of the Geopark, we find **the site of El Malagón (Cúllar),** located on top of a small hill, at the base of which outcrops of copper have been found, and the **walled settlement of Cerro de la Virgen (Orce).** Occupation of the latter coincides with abandonment of the former, and it constitutes the most important settlement in the area at this time.

During this same period, in the western part of Andalusia up to the River Gor, in Gorafe, **megalithism developed,** characterised by necropolises with dolmens made with large blocks of stone. These ones in Gorafe, which represent the greatest concentration in Spain (242 dolmens), make up the **Integral Megalithic Theme Park.**

Fig. C. 11 | Table of sites of cultural interest

SITES OF CULTURAL INTEREST	DESCRIPTION	NEARBY SITES OF GEOLOGICAL INTEREST
Medieval caves: cave-dwelling complex of Algarbes-Camariles at Beas de Guadix, Covarrones de Cortes and the Cave of Tía Micaela Cave-dwelling villages Los Anteojos Cave	These two areas have the largest concentration of medieval caves in the region and some of the most notable cave villages	GG-01 GG-38 GG-51 GG-53
Centre of the Hoya de Baza – River Baza-Galera crossing		GG-55 GG-56 GG-58 GG-59 GG-60 GG-66 GG-68 GG-69
Asset of Cultural Interest (BIC): Archaeological Area	**General Catalogue of Andalusian Historical Heritage**	
Orce basin	Archaeological Areas are those clearly delimited spaces where the existence of archaeological or palaeontological remains of significant interest related to the history of humanity has been confirmed. The archaeological area of the Orce Basin, located northeast of the Guadix-Baza district, contains a large number of sites that provide first-rate information for knowledge and understanding of the evolutionary context of hominids outside Africa. Very important for its significance and size.	GG-61 GG-62 GG-63
Cerro de la Virgen (Orce)		GG-61 GG-62 GG-63
Castellón Alto (Galera) Iberian Necropolis of Tutugi (Galera)		GG-59 GG-60 GG-66 GG-68 GG-69
El Malagón (Cúllar) Cúllar-Baza I (Cúllar)		GG-57

Basti: Site (Cerro Cepero) Necropolis (Cerro Santuario) Necropolis (Cerro Largo) – (Baza)	Out of 33 Archaeological Areas for the province of Granada included in the General Catalogue of Andalusian Historical Heritage, 17 are within the Geopark, which highlights its archaeological importance	GG-24 GG-29 GG-33 GG-43
Las Angosturas (Gor)		GG-04 GG-25
La Terrera del Reloj (Dehesas de Guadix)		GG-03 GG-28
Baños de Alicún (Villanueva de las Torres)		GG-03
Megalithic necropolis of Fonelas Cerro del Gallo (Fonelas)		GG-08 GG-10 GG-19
Solana del Zamborino (Fonelas)		GG-11
Cueva Horá (Darro)		GG-12
Cuesta del Negro (Purullena)		GG-53
Roman theatre (Guadix)		GG-01 GG-38 GG-44
Cerro de los Castellones (Morelábor)		GG-15 GG-54
Asset of Cultural Interest (BIC): Historical Complex	**General Catalogue of Andalusian Historical Heritage**	
Historical complex of Guadix	Historical Complexes are groupings of urban or rural constructions, together with the geographical features that shape them, that are significant for their historical and archaeological interest, etc.	GG-01 GG-38 GG-44
Historical complex of Baza		
Historical complex of Castril		GG-24 GG-29 GG-33 GG-43 GG-65

Asset of Cultural Interest (BIC): Historical Building – Military Architecture	**General Catalogue of Andalusian Historical Heritage**	
Alcazaba of Guadix	Archaeological Areas are those clearly delimited spaces where the existence of archaeological or palaeontological remains of significant interest related to the history of humanity has been confirmed. The archaeological area of the Orce Basin, located northeast of the Guadix-Baza district, contains a large number of sites that provide first-rate information for knowledge and understanding of the evolutionary context of hominids outside Africa. Very important for its significance and size.	GG-01 GG-38 GG-44
Castril Castle		GG-65
La Calahorra Castle-Palace		GG-71
Alcazaba of the Seven Towers		GG-61 GG-62 GG-63
Defensive System of the Eastern Frontier of the Former Nasrid Kingdom		Practically all
Andalusian Network Of Cultural Spaces (Reca)		
Castellón Alto (Galera) Necropolis of Tutugi (Galera)	Law 14/2007, of 26 November, on the Historical Heritage of Andalusia, defines the RECA as *an integrated and unitary system made up of the cultural spaces located in the territory of the Autonomous Community that are included in the Network by the Regional Government Department competent in matters of historical heritage, and also sites open to the public whose conditions and characteristics do not require them to have a management body of their own*	GG-59 GG-60 GG-66 GG-68 GG-69
Moorish Baths of Baza		GG-24 GG-29 GG-33 GG-43
Andalusian Landscapes Of Cultural Interest	**Andalusian Landscape Strategy**	
Landscape of Guadix and Purullena	The Andalusian Landscapes of Cultural Interest are landscapes unique for their tangible and intangible cultural values. They are representative of the various forms of interaction between human beings and the physical environment for the purpose of satisfying their need for settlement, safety, communication, production and transformation of resources, as well as their ideological appropriation	GG-01 GG-38 GG-51 GG-53
Megalithic landscape of the River Gor Valley		GG-04 GG-20 GG-21 GG-25
Recreated landscape of the Cerro de Jabalcón		GG-07 GG-33 GG-42 GG-70
Landscape of Castellón Alto		GG-59 GG-60 GG-66 GG-68 GG-69
Landscape of Castril		GG-65

From the Bronze Age onwards, settlement and pressure on the environment gradually intensified.

In the Full Bronze Age we find the territory occupied on an organised basis by a large number of **Argaric settlements,** generally located on steep hills next to the river valleys, of which the best known are Castellón Alto in Galera and Cuesta del Negro in Purullena.

In the Iberian era, the territory was structured around large oppida (towns), such as Tutugi in Galera or Basti in Baza, with **extensive monumental necropolises** from which such important pieces as the Lady of Baza originate.

In Roman and Medieval times, the area continued to be of great importance. Remains from all these periods are still present throughout the territory, though special mention could be made of the presence of a **Roman theatre in Guadix.**

The **Guadix-Baza basin** can be regarded as one vast archaeological site because of the considerable number of individual sites it contains and the fact that it has been occupied continuously from prehistoric times to the present day, which speaks to us of the area's rich heritage while indicating at the same time that the transformations of the environment have not been very great.

Meanwhile, in other areas with the same archaeological potential, the **disappearance of archaeological remains** in the face of advancing urbanisation, infrastructure and transformations of farming is obvious.

However, this territory is an area where we can find one of the best records of the past of the southeastern Iberian Peninsula and it can be studied and grasped from an overall spatial perspective, not just on the basis of a single point or archaeological site.

Moreover, this record enables us to carry out a diachronic historical assessment of the whole territory over time.

With regard to the resources available to the Granada Geopark for enhancing and preserving the cultural heritage of the territory, mention can be made of the actions of the Regional Government's Directorate General for Cultural Assets and Museums in the field of **conservation and optimisation of the historical heritage of Andalusia.** Through this body, activities are promoted in the territory's heritage, with special attention to the measures for protecting the assets registered in the General Catalogue of Andalusian Historical Heritage. Finally, the **Red de Espacios Culturales de Andalucía (RECA: Andalusian Network of Cultural Spaces)** includes management of the sites of Castellón Alto, the Iberian Necropolis of Tutugi and the Moorish Baths of Baza. Besides, collaboration between central, regional and local government makes it possible to introduce measures every year for the maintenance and conservation of the heritage included in the territory of the Geopark.

These actions were developed within the framework of the Programme for the Promotion of Agricultural Employment, which includes actions for **improvement of routes and paths, restoration of natural and cultural heritage, reforestation, and conservation of woodland and rural roads.**

In addition, the territory has public resources (museums and interpretation centres) which conduct **research, conservation, dissemination and teaching work.**

These resources make up the Geopark's network of information centres and form part of a working group responsible for heritage conservation and protection.

(See section A.2.5. Facilities and infrastructure)

C2.4. Intangible heritage of the Geopark

The cultural heritage of a territory is not limited to monuments, buildings and archaeological sites (immovable heritage) and collections of objects (movable heritage) but also includes the traditions or living expressions inherited from our ancestors and passed down from generation to generation.

The Convention for the Safeguarding of the Intangible Cultural Heritage, approved by the General Conference of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) at its 32nd meeting held in Paris in September/October 2003, defines intangible cultural heritage as the **practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognise as part of their cultural heritage.** This intangible cultural heritage, transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity.

The Atlas of Andalusian Intangible Heritage articulates the intangible heritage of our autonomous community in four major categories, which include all the examples that have been collected for the area of the Granada Geopark in the categories of **festive rituals, trades and knowledge, forms of expression and culinary practices.**

As well as these manifestations, types of knowledge, traditions and elements, there are others in the Geopark of unquestionable cultural value that have not been included in the Atlas, among which we could mention the famous **bull-running festivals** held in the municipalities of Gor, La Calahorra, Jerez del Marquesado and La Peza, the last of which was recently declared to be of Andalusian Tourist

Interest, the **festivities of St Anthony and St Sebastian** in Orce, and the **Christmas Festival *(Cascaborras)*** in Puebla de Don Fadrique.

At the end of the medieval period new celebrations appeared, such as the **Virgen de la Piedad (Our Lady of Pity),** which has united the towns of Baza and Guadix since the end of the fifteenth century in an important festival known as ***Cascamorras*,** declared to be of International Tourist Interest in August 2013. In Puebla de Don Fadrique and Huéscar a local festivity is celebrated every year in honour of Saints Alodia and Nunilo.

It is also important to mention the **Festival of Moors and Christians,** which takes place every year in Zújar, Benamaurel and Cúllar, and of course special emphasis should be given to the **Holy Week** celebrations in each and every town in the northeast of Granada. Fig. C. 11

Old trades are also intangible resources that it is important to protect and preserve. The **ceramic crafts of Guadix and Purullena are especially noteworthy in the area.** Equally important, however, are **woodworking, esparto grass weaving and making cured meats.**

The culture departments of local authorities and the Provincial Council (Diputación) of Granada, as well as ethnographic centres and local museums, help to keep these traditions alive. The celebration of festivals, pilgrimages and processions is deeply rooted in society and also constitutes a tourist attraction.

All this heritage is highlighted and interpreted through the Geopark's education programme and the network of information centres, making it available to the local population, students and visitors.

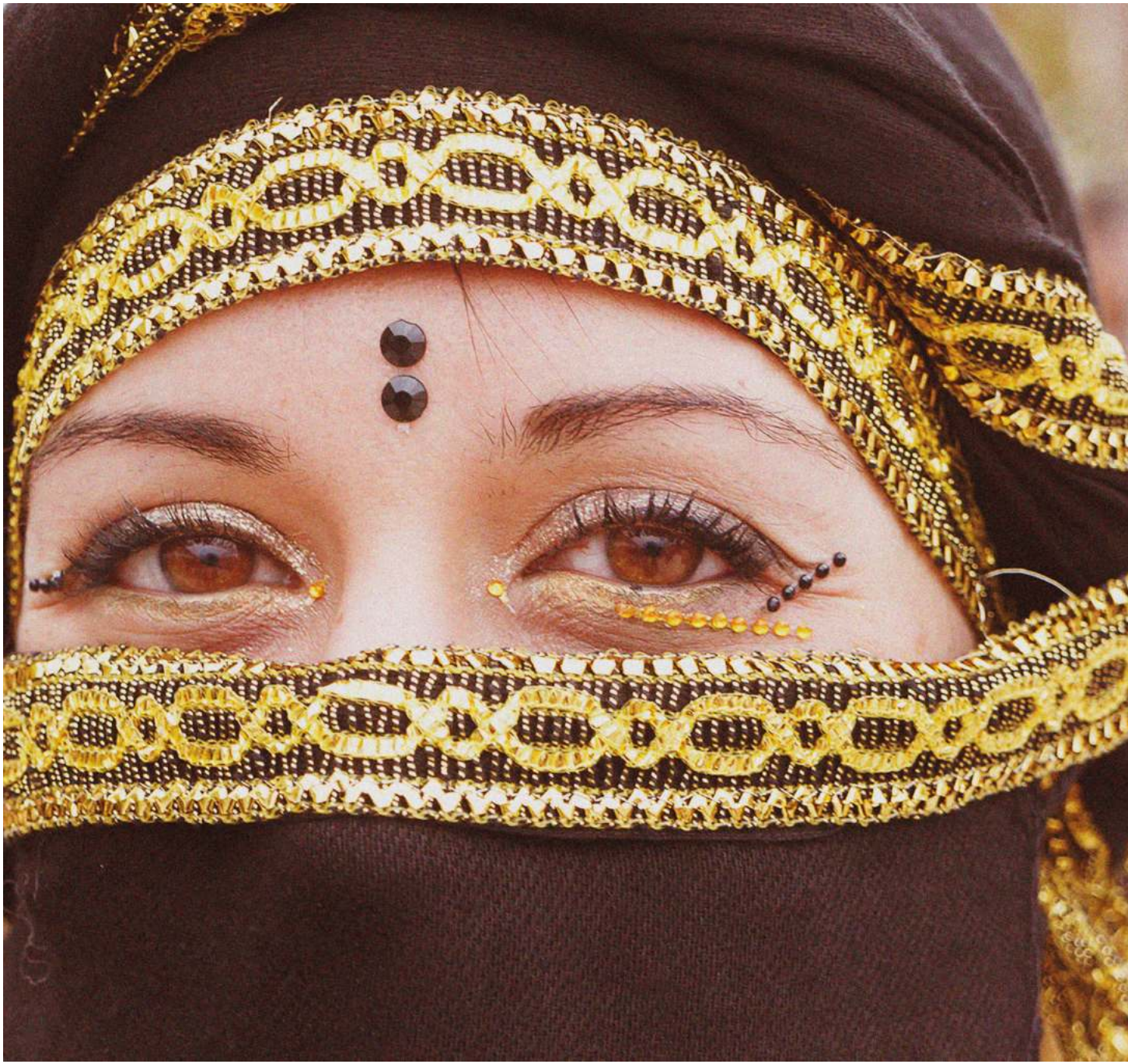


Fig. C. 11 | *The Look,* Festival of Moors and Christians in Benamaurel
@Antonio Troyano Otero

D

SUSTAINABLE DEVELOPMENT IN THE GRANADA GEOPARK

D1. INTRODUCTION

Although the Geopark is an area with many natural and cultural resources, it is also an ageing and depopulated territory. **More than 20 municipalities are at risk of disappearing,** since the young population is abandoning its villages to move to the city and there is no generational replacement.

For this reason, the public authorities decided to support this exciting initiative, in collaboration with representatives of professional associations and the local population, and to implement a participatory, bottom-up strategy, aimed at **preserving the most important natural and cultural heritage of the area** as a resource to develop sustainable and **responsible ecotourism,** which also represents an opportunity to promote the territory worldwide.

Once the Granada Geopark project began to be defined, local organisations recognised the need to change their work strategy.

The small municipalities, on their own, did not have the capacity to promote their territories, and only by combining resources and efforts could this area of the province of Granada have an opportunity for the future. This project is an example of the **importance of working together.**

Another important issue has been the creation of working networks with outside entities and institutions, since learning and cooperation with other territories, to exchange experiences or acquire skills and knowledge, have been crucial.

The process carried out and the **sustainable development strategy** that has been implemented in the Geopark are of an all-embracing nature; in other words, they treat the economic, social, cultural and environmental aspects of the territory jointly, taking account of the interactions that occur between all these spheres.

Since this initiative was set in motion, there has been a change of trend:

- **The increase in the number of visitors** has allowed new entrepreneurial initiatives to emerge.
- The local population has discovered the **importance of its natural and cultural heritage.**
- **Local organisations** are collaborating with the same objective.
- The **Local Development Groups** have managed to get all the associations to work together.
- A network of **Geopark heritage information centres** has been created, grouping together the territory's tourist offices, museums and interpretation centres.
- **Activities linked to geological heritage** are generating more interest in Geopark visitors.
- The businesses that have emerged, or have increased their activity, with the Geopark initiative are **offering more competitive products.**
- Community participation has reinforced local identity, helping to **revive old traditions.**

In collaboration with representatives of professional associations and the local population, a participatory, bottom-up strategy has been implemented, aimed at preserving the most important natural and cultural heritage of the area, as a resource to develop sustainable and responsible ecotourism.

D2. PARTICIPATORY PROCESS

Revitalisation is a basic tool for the sustainable development of any territory aiming to formulate an action plan for the social and economic improvement of its municipalities.

But planning processes, in the medium and long term, require **far-reaching changes** and can only be undertaken with a broad social consensus and shared effort, through the participation of public and private actors. Promoting the **participation of all sectors of society** is key to tackling inclusive and sustainable economic development initiatives that will improve living standards.

Geoparks, like every sustainable socioeconomic process, require a **strategy that must be carried out from the bottom up,** with the participation of all the agents in the civil society of the territory and with the collaboration of themain institutional stakeholders.

This makes it easier for people to relate to each other face to face, so that they can find synergies and complementarities, for **mutual support,** and design progress strategies for their community.

For this reason, a participatory process was implemented in the Granada Geopark, with the aim of involving and achieving the active participation of all territorial actors. From the beginning of this initiative, with the application proposal and during the process of defining its own development strategy, it has been important to **incorporate as many perspectives as possible.** Both local governments and social and economic stakeholders and the public have respectively taken a share of responsibility in formulating it.

This has required an effort of **educating the population to prepare them to engage and collaborate** in a process of such complexity. But in turn it has helped to generate a greater consensus around the strategy, with people adopting the lines of action as their own, and to strengthen the bonds between the actors in the territory by creating a culture of **local identity.**

The actions implemented to foster participation and consultation are set out in the **Granada Geopark Participation Plan,** which is put into effect in its management structure. This structure represents a methodology of cooperation and participation with all those who play an active part and is reflected in the composition of the **Working Groups.**

It was carried out by creating various thematic forums, representing all the agents involved in the process, where cross-sectional and sectoral issues have been debated. In addition, questionnaires were designed and distributed, interviews were conducted, etc. The **interdisciplinarity and diversity of the group of people** who participated in the process have been essential.

During the diagnostic stage, it was very enlightening to discover the reality, values, perceptions and attitudes of the various agents and entities involved, producing a climate of collaboration, trust, respect, information and dialogue which made it possible to express a range of opinions and to manage the conflicts of interest generated during the process.

The Geopark's technical team was responsible for energising it, designing the methodology and adapting it to the reality on the ground to detect needs, organising and coordinating the participation forums and working teams, incorporating the contributions obtained and sending the information and results back to the participants.

All this was backed by a **broad political agreement,** on the part of the local governments involved, to promote and collaborate in the development process initiated.

This working model created the habit of collaboration between the public and the Geopark's technical team and developed a sense of belonging and of people identifying with their environment, which will make it possible to plan over the long term, facilitating the continuity of the measures that are decided upon.

The result of all this work was the formulation of the **Geopark Development Strategy,** with the forums created driving and validating the process.

This strategy basically rests on **three essential foundations: the education programme, the scientific research programme and the tourism development programme.**

The Granada Geopark's education programme is very thorough:

D3. EDUCATION PROGRAMME

D3.1. Environmental education programme

The Granada Geopark has implemented an ambitious environmental education programme with activities aimed at the local educational community, tourism sector and social agents, with the aim of **promoting knowledge of the territory as a basis for ensuring its conservation and sustainable development, creating identity in the Geopark and empowering the local community.**

Its objective is to address environmental challenges at both global and local level and to raise awareness of the value of geological heritage and its connection to the biodiversity, history and culture of this territory.

Regular activities are conducted on **awareness-raising, volunteer work and environmental education.**

Teaching units, information campaigns and educational resources have been created, as well as numerous workshops and training programmes.

In addition, since 2017, a collaboration agreement has been established with the Teacher In-Service Training Centres in Guadix and Baza (under the authority of the Department of Education and Sport of the Regional Government of Andalusia [Junta de Andalucía]), with the aim of i**ntensively integrating the scientific content of the Geopark into the primary and secondary education** curriculum, generating specific teaching material on its characteristics and the most important aspects of its geological and palaeontological heritage.

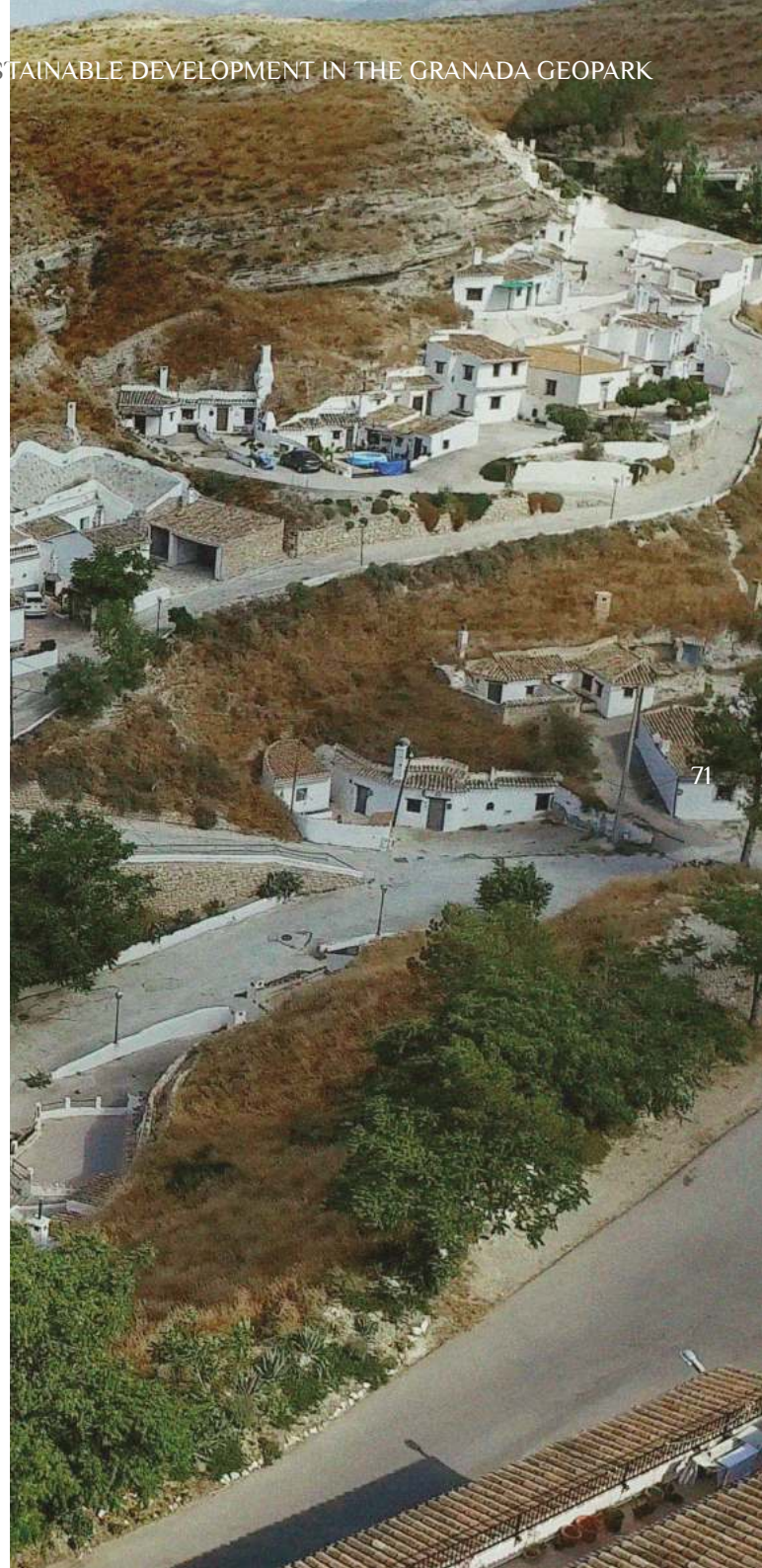
A programme of guided visits to the Granada Geopark for school and university students is also being developed, and activities involving undergraduate and master's degree students in various Spanish universities.

There is a wide range of **environmental education activities aimed at the tourism sector:** Geolodía *(Geolo-day),* World Environment Day, World Wetlands Day, organisation of guided visits and archaeological workshops for families and groups, environmental information, a series of lectures in the municipalities of the territory, etc.

In relation to the environmental line of work with social agents, it is worth highlighting **guided tours** to sites of geological interest for local businesspeople, young entrepreneurs, associations, etc.

For their part, 90% of the municipalities in the Granada Geopark are implementing Agenda 21 or have signed sustainability agreements (Aalborg +10, *Pacto Local por la Sostenibilidad* [Local Pact for Sustainability]) or are part of the **GRAMAS** (Granada Municipalities towards Sustainability) network and share the objectives of the 2030 Strategy.

Furthermore, since this development strategy was put into effect, many courses related to natural and cultural heritage have been organised, aimed at a very varied audience, with the aim of providing students from a range of educational levels, businesspeople and the local population with a deeper and closer knowledge of the important value of the territory they live in, and thereby making them the **best ambassadors for the Granada Geopark.**



D3.2. Geo-education

The Geopark has been conducting occasional geo-education activities since the end of the 1990s. In this connection, it is important to highlight both the holding of **international conferences** related to human palaeontology and the periodic visits of university students to the territory's resources.

Moreover, the *Know Your District and Discover Your Past* programme (2003–2006), aimed at schoolchildren in the area, developed teaching material suited to the educational needs of primary schools, which was included in the school curriculum by local teachers. Figs. D. 1 and D. 2

There are **129 state schools** in the Geopark providing school education for children up to the age of 16. In addition, there are **11 schools offering bachillerato** (baccalaureate), 7 of which also offer intermediate and higher vocational training.

There are also four music schools or conservatoires, 2 schools of arts and crafts, 2 official language schools and 1 branch of the Universidad Nacional de Educación a Distancia (UNED: National University of Distance Education).

The Granada Geopark's education programme conducts **training activities for schoolteachers** on the geological values of the territory, biodiversity and natural heritage. The territory's geological and natural resources are visited annually by the students and teachers in the area, as part of the school calendar.

Since 2016 there has been a **specific training programme,** held annually, designed by the Education Working Group composed of the directors of the Teacher In-Service Training Centres, the Rural Development Groups and the Provincial Council of Granada, with the supervision of the Scientific Committee and the Geopark's geologist. The object of the training is to **develop teaching units with the geological and natural resources of the territory, to be incorporated into the students' teaching content.**

Fig. D. 1

Fig. D. 1| Visit to the geological resources with schoolchildren from the territory
@Provincial Council of Granada

Fig. D. 2 | Development teaching guide
Know Your District and Discover Your Past
@Guadix Rural Development Group

Fig. D. 3 | Training activities for university students
@EPVRF-IGME

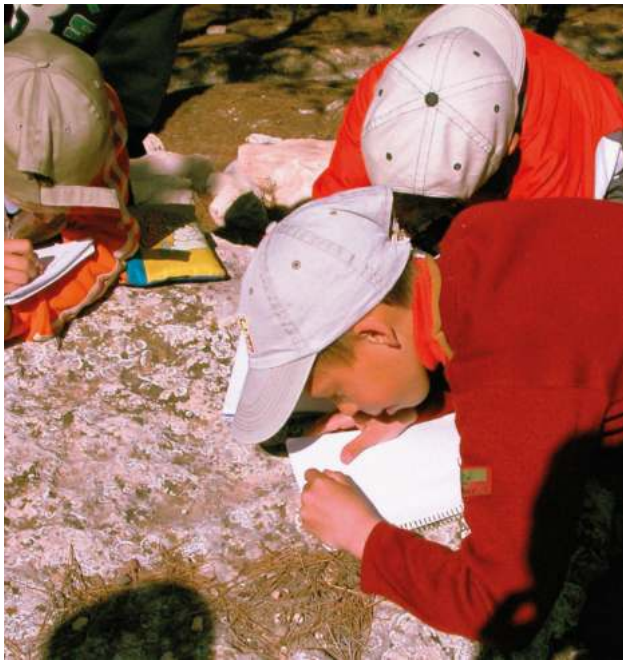


Fig. D. 2

Fig. D. 3

An outstanding event from the scientific point of view is the **summer course on Palaeontology of the Quaternary in the Guadix Basin,** an eminently practical course on basic aspects of geology and vertebrate palaeontology of the Quaternary, which also provides first-hand knowledge of some of the most important landscapes and sites of geological interest in the Geopark. The **River Fardes Valley Palaeontological Station (EPVRF) of the Geological and Mining Institute of Spain (IGME)** is one of the locations where the field training activities take place, like the annual geology course taught in the Granada Geopark. Figs. D. 3 and D. 4

In addition to these events, geo-education activities are periodically conducted through collaboration between town councils, exhibition centres in the territory, cultural associations and schools. Some examples are the Star Party Astrotourism Conference (Gorafe), Lady of Baza Week (Baza), Encounters with your Heritage (Huéscar and Galera) and the Mountain Bike Geo-Route of the Complete Valleys of Northern Granada. Fig. D. 5

The International Rural Tourism and Nature School (ENTURNA) organises various supplementary training activities for non-specialists on the heritage of the Geopark, the most notable of which are those concerning the different forms of accommodation (cave houses), landscape and nature photography courses, and technical seminars on geological heritage and geotourism in the Guadix-Baza Basin.

In addition, the International School has launched various training activities aimed at the managers of centres belonging to the **Network of Geopark Heritage Information Centres,** to widen their knowledge of the territory's heritage resources as a whole so as to enhance their ability to inform visitors about the Granada Geopark, and also to use the tools to collaborate in managing tourism data. Similarly, ENTURNA has implemented a training programme expressly aimed at the local business sector to provide deeper knowledge of the Geopark's heritage resources, tools to improve the promotion of their businesses and the training needed to inform visitors to the territory.

For its part, the Provincial Council of Granada, through its training and **employment programmes,** organises training itineraries aimed at **unemployed people and the most disadvantaged groups in the territory,** involving theoretical and practical training conducted in local companies. An example of these itineraries is the one for **Geopark Tourist Guides,** designed to provide job placements for young people between the ages of 16 and 29.

Fig. D. 5

Fig. D. 4| Summer course on *Palaeontology of the Quaternary in the Guadix Basin @EPVRF*

Fig. D. 5| Guided visits for groups *@Provincial Council of Granada*

Fig. D. 4

D4. SCIENTIFIC RESEARCH PROGRAMME

As mentioned in section B of this document, the history of scientific research on the geology of the Granada Geopark goes back to the first half of the seventeenth century (see *Section B).*

Up to the present day there has been a continuous succession of advances in this field on the part of various institutions, both national and international, that are interested in these processes and resources.

With good reason, alongside the creation of the Geopark a **scientific committee** was set up for it, composed of researchers specializing in various disciplines, the object of which is to **advise, coordinate and promote activities** related to the **study, analysis and dissemination of the resources of this territory.**

This working group meets periodically to explore knowledge of the Geopark's resources, making them accessible to the public, discovering and studying new sites of geological interest, disseminating their value and raising awareness of the importance of their proper conservation. Fig. D. 6

Fig. D. 6

Fig. D. 6 | Meeting of the Scientific Committee of the Granada Geopark

D5. TOURISM DEVELOPMENT IN THE GEOPARK

Geoparks can be regarded as the **most innovative destinations** for sustainable tourism, and specifically, geotourism in these spaces has proved to be an emerging model in the national and international market.

They are ideal places in which to develop environmentally friendly nature and cultural tourism, where spectacular landscapes and locations conceal fascinating stories dating back millions of years. These spaces provide an opportunity to **promote the local character and quality of proximity products,** ensuring a social and environmental sustainability ideal for practising ecotourism.

Sustainable tourism, as a strategic tool for local economic development, represents an opportunity for some rural areas where there are not many alternative sources of economic activity.

The Granada Geopark has enormous potential due to the exceptional nature of its territory, and it is taking advantage of that fact to attract this kind of tourism.

Since 2008, the Regional Government has been developing the **General Plan for Sustainable Tourism in Andalusia,** which expressly establishes the promotion of this type of sustainable tourism as a strategic sector of the region's eco-

nomy. In the Geopark, this plan is put into practice through the **Cave-Dwelling Landscapes Sustainable Tourism Initiative (ITS),** based on tourism linked to this distinctive heritage of the territory. Some of the tourism companies in the area have subscribed to the European Charter for Sustainable Development.

According to the data obtained by the **Tourism Observatory of the Province of Granada** since 2018, there has been a gradual increase in the number of visits and overnight stays in hotel establishments in the area. This confirms how important the dissemination activities conducted by the Granada Geopark have been. Fig. D. 7

VERIFIABLE DATA

Domestic tourists:

| **Andalusia** (45,6%)
| **Region of Murcia** (17,1%)
| **Valencian Community** (14,2%)

International tourists:

| **France** (1,6%)
| **United Kingdom** (1,4%)
| **Germany** (0,8%)

The tourist profile is predominantly families (41%) with an age range of 30–44 (36.5%). The main reason for travelling is cultural visits (42.9%)

One of the activities that has made the greatest impact is **astronomical observations.** The Granada Geopark enjoys ideal conditions for developing **astrotourism,** not only because of its clean, dark night skies but also because of the high number of nights per year on which it can be practised without cloud cover.

These activities help to spread astronomical knowledge and to raise awareness of the need to preserve the quality of these skies against light pollution.

The elements most highly valued by visitors are **peacefulness, hospitality and conservation of the environment.**

It is also important to highlight the Granada Geopark's most representative good practices in geotourism and ecotourism which favour the development of this sector in the area.

To cite some examples of **activities linked to geological heritage,** there are guided tours with specialists, educational itineraries, exhibitions, talks and dissemination workshops, environmental education, and courses for training guides.

There are others related to **archaeological heritage,** such as cultural visits, museums and interpretation centres, interpretation tours and experiences with popular traditions.

And there is a wide range of **active and nature tourism** activities such as hiking, cycling tourism, raids, horse-riding routes, birdwatching, water activities (canoeing, etc.), thermal tourism, astronomical observation, agritourism or hot-air ballooning, among others. As for the strengths of the territory and the opportunities for ensuring ecotourism and geotourism activities in the Granada Geopark, the most salient are the following:

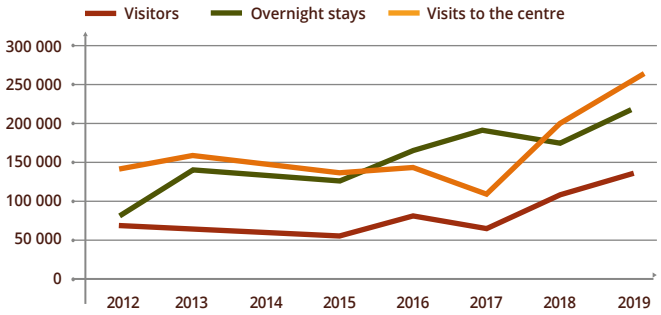


Fig. D.7| Change in the number of visitors.
@Granada Tourism Observatory, Provincial Council of Granada

STRENGTHS

A wide variety of tourism resources of **high value and quality Geological, palaeontological and archaeological** richness and diversity

Territory of **high scenic value**

Very **rich heritage: natural, cultural and historical**

High-quality range of **culinary options** linked to **local products**

Unique type of accommodation closely linked to the territory and to sustainability: **cave houses**

Geological sites of international importance

Rich **ethnographic heritage**

Communications hub: transit area between Andalusia, Valencia and Murcia

Varied range of **rural accommodation**

OPPORTUNITIES

Gradual **tourism development,** including residential tourism

Destination for retirement

Creation and **consolidation of heritage-related** tourism **products**

Emerging market for ecological, rural and cultural tourism worldwide

Large number of **professionals** and graduates from the territory who could return or stay and start businesses

Promotion of **accommodation** aimed at **young people:** hostels, campsites with charm...

Natural and cultural heritage leads to the emergence of more a**ctive tourism companies**

POTENTIALITIES

The **implementation of a territorial strategy** for sustainable and lasting socioeconomic development

A **20% to 30% increase** in visitors over a period of 4 years

International positioning in terms of tourism and science

Need to **encourage** the continuity and **creation of local businesses**

Slowing the trend toward **depopulation** and **keeping the local population** in the territory

Growth of key **economic sectors** in the area: hospitality, local trade, agriculture, etc.

Greater respect for the territory's traditional **resources and landscapes**

Tourism is therefore an efficient engine for development in the area, because of its ability to **create employment, modernise infrastructure, stimulate other productive activities and enhance the value of local resources.**

Since 1996, various Rural Development Programmes funded by the EU and the Regional Government (Junta de Andalucía) have been developed, within the framework of European Union Rural Development policies. Through the **LEADER initiative** (FEADER funds), now integrated into so-called Participative Local Development, actions have been carried out in the Geopark aimed at enhancing the natural and cultural heritage, supporting enterprise, improving and creating small infrastructure for public use and promoting all projects capable of creating employment, in the field of Geoturismo.

From 2009 onwards, the foregoing programme has been supplemented by interterritorial and transnational cooperation projects within the framework of the National Rural Network, funded by the Spanish State and carried out by the Local Action Groups, with the object of contributing to economic diversification, modernisation and the multi-functionality of the rural environment, within the framework of sustainable development.

In this context, the joint cooperation action *Geodiversity: A Solution for Sustainable Rural Development?* was developed during the period from 2007 to 2009, resulting in interesting products for geotourism, such as the guide **Geotourist Itinerary of the Guadix and Baza Basin.** During the development of the Rural Development Programme for the period 2014–2020, the Rural Development Groups were the entities that channelled the actions of this programme in various spheres, and specifically in cultural tourism and ecotourism. Figs. D. 8 and D. 9

Since 2015, the number of activities in favour of **geotourism** has increased, through the programming of countless training actions, as well as a notable presence of the Geopark in **ENTURNA** facilities, with the aim of **raising awareness of this valuable space** and referring visitors to it. Figs. D. 10, D. 11, D. 12 and D.13

Fig. D. 8

Fig. D. 8 | Geo-hiking in the Granada Geopark *@Rafael Toledo*

Fig. D. 9 | One of the active tourism activities in the Geopark is balloon flights *@Alberto Tauste*

Fig. D. 9

Fig. D. 10

Fig. D. 10 | Cycle route
in the Granada Geopark
@TECOS Guadix

Fig. D. 11 | Cultural activities
in geological settings
@Ayuntamiento de Guadix

Fig. D. 12 | Lecture by the geologist
Francisco Juan García Tortosa in 2019

Fig. D. 13 | Training courses for
businesspeople and entrepreneurs
in the territory
@Provincial Council of Granada

Fig. D. 11

Fig. D. 12

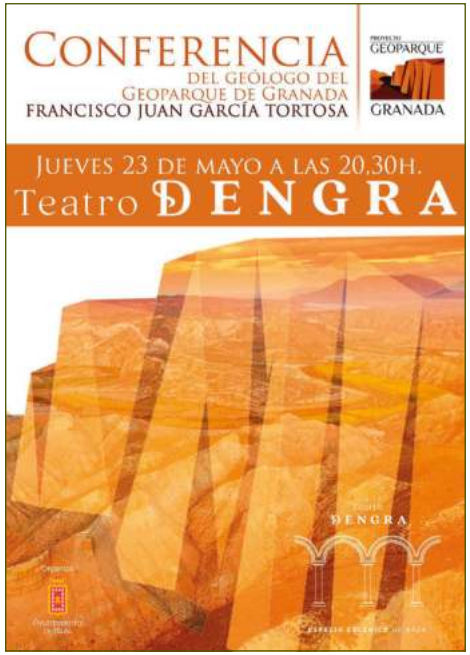


Fig. D. 13

D6. LOCAL PRODUCTS

D6.1. Branding policy for local products

The most important economic sectors for the territory are **agriculture and livestock farming, commercial activity and tourism.** The provision of services to the population also stands out as an emerging economic activity.

The **primary sector** is one of the most traditional and important sectors in the Geopark. It represents one of the area's main opportunities for socioeconomic development of the territory and for the establishment of new business and young farmers.

The agricultural activity is based on rainfed crops, mainly wheat, barley, legumes, olives, almonds and vines. In the case of olives, the **Montes de Granada PDO (Protected Designation of Origin)** regulates the **virgin olive oil** that has been produced in the area since ancient times. For the area's **wine producers,** the **Designation of Origin *Vinos de calidad de Granada*** and the **Protected Geographical Indication *Vino de la Tierra – Altiplano de Sierra Nevada*** have made it possible to transform the sector towards quality products, modernising the wineries and opening them up to new markets. Similarly, the **Designation of Origin *Miel de Granada*** is responsible for managing and promoting the quality honeys produced in the territory. Figs. D. 14, D. 15 and D. 16

The predominant extensive livestock sector in the district is **sheep farming,** notably the local breed of ***Segureño* lamb,** perfectly adapted to the extreme climatic conditions and mountainous terrain of the Geopark. The **Protected Geographical Indication *Cordero Segureño*** has regulated the quality of its meat since 2013, marketing more than 4,000 certified lambs per year. Livestock farms in the district are usually mixed, combining flocks of sheep with small herds of goats. Fig. D. 17

Fig. D. 14

Fig. D. 14 | Vines in the territory of the Geopark
@Provincial Council of Granada

Fig. D. 15 | Production of Montes de Granada PDO virgin olive oil
@Provincial Council of Granada

Fig. D. 15

Agribusiness is therefore one of the important factors for socioeconomic development, as it generates added value by transforming the products of the area into processed foods to be marketed.

Trade is the predominant activity in the urban centres with the highest population. It is local trade between producers and consumers, which brings numerous advantages. It fosters social relationships, stimulates the local economy and employment, offers unique products grown or produced in the district itself and represents a diversified economy, more intimate, friendly to the environment and to the health of the local inhabitants.

Moreover, the highest percentage of shops are located in the urban centres of the Geopark, contributing directly to the conservation and maintenance of **sustainable local commercial activity.**

As regards **crafts,** the most widespread is **ceramics,** with a long tradition stretching back to prehistoric times. The abundance of clay in part of the territory is conducive to the development of this activity and makes it possible to produce **highly characteristic pottery,** with indigenous forms such as pitchers and *jarras accitanas* (ornate Guadix jugs). The production of **esparto grass articles** also comes from making use of local vegetation, as does bulrush chairmaking.

Other craft products typical of the territory are **artistic wrought ironwork, craft bakeries** – some with organic production certificates and wood-fired ovens – making products and sweets whose origins date back to the Morisco heritage of this area of Andalusia. The production and sale of local products such as **traditional cured meats, wines, cheeses and oils** are a very important part of the local economy.

Fig. D. 16 | The main factor influencing the quality and distinctive character of Granada honey is the flora of the province *@Provincial Council of Granada*

Fig. D. 17 | *Segureño* lamb adapted to a rugged area, producing top-quality meat that is valued nationally and internationally *@Provincial Council of Granada*


Fig. D. 16


Fig. D. 17

D6.2. *Granada Geopark* brand

The Granada Geopark has created a **brand,** which is the most solid basis for generating loyalty, rapid identification and connection with the project.

The ***Granada Geopark*** **brand** highlights and differentiates natural and craft products and/or services of local businesses that are produced or conduct their activity in the Geopark. It is also a **sign of geographical and territorial identity,** and serves to raise the profile of the Geopark and promote it at the provincial, national and international level.

To make use of this brand, the products and/or services must comply with a **series of criteria and a quality standard,** defined in the brand regulations, as well as being environmentally friendly.

Other quality marks present in the territory are: The ***Sabor Granada*** **(Granada Flavour)** quality mark. Promoted by the Provincial Council of Granada, this is the distinguishing mark of quality **agrifood products** from the province of Granada. This mark works with the agrifood industry in the area to support and promote the local products it endorses.

Sabor Granada gives impetus to the promotion of an excellent range of local products both nationally and internationally, attending a number of fairs and events with a joint brand image. Fig. D. 18

The ***Rural Altiplano de Granada*** **(Rural High Plateau of Granada) quality mark** distinguishes the **best agrifood products and tourism and restaurant services,** as well as places to visit in the north of Granada. This mark can be displayed by companies or organisations in the area that are committed to improving quality.

Their activity is representative of the territory and generates added value for it. The ***Rural Altiplano de Granada*** quality mark is part of a Club comprising European territorial marks, all united under a common image: ***RURAL QUALITY.*** Figs. D. 19 and D. 20

Fig. D. 19

Sabor Granada

Fig. D. 18

Calidad Rural

ALTIPLANO DE GRANADA

Fig. D. 19

Fig. D. 18 | Logo of the *Sabor Granada* quality mark

Fig. D. 19 | Logo of the *Altiplano de Granada* quality mark

D7. VISIBILITY OF THE GRANADA GEOPARK

Numerous actions have been launched in the Granada Geopark to **raise the profile of the project,** with the aim of informing the public about its heritage and unique features, and also about the educational, scientific and geotourism activities being conducted.

Most of these actions are part of the **Granada Geopark Communication Plan,** designed to publicise the Geopark and promote the active participation of socioeconomic agents and the local population:

- **It has a website,** where visitors can browse and find information about the Geopark, maps and heritage resources, sites of geological and tourist interest, events, sports and educational activities, contact details, the head office of the Geopark, etc. Since heritage is common property and the information must reach as many people as possible, it is being adapted to other languages and made accessible to everyone that may be interested in visiting and getting to know this Geopark, even if they have some physical, auditory or visual impairment.

- The Granada Geopark also uses **social media** for greater visibility, through **Facebook, Twitter and Instagram,** and participates in the social media of the **Spanish Geoparks Forum.** Every year, since 2017, it has been contributing to the Twitter international event *(Talking about Twitter),* which is held in Granada. The Geopark's presence at this event is very active, stimulating the participation of those attending by holding a raffle with a different prize each year through this social media platform, generating widespread publicity for the Geopark. Figs. D. 21 and D. 22

- **The Geopark's promotional video** has reached a large number of views. Another **four videos** have also been recorded to promote the varied natural and cultural heritage of the territory, reinforcing dissemination and knowledge of the Geopark.

All these videos are in the tourist offices and can be seen in the heritage information centres distributed all over the territory.

They are published in English and Spanish and subtitled in both languages. The Geopark constantly participates in various kinds of **promotional events, fairs and meetings,** both nationally and internationally, such as the Annual Ecotourism Conference, FITUR, local FERMASA Fairs, the Agrifood Products Fair, exchange visits with other Geoparks, etc.

One of the events with the greatest impact is **European Geoparks Week,** which is held every year, in the spring, in all the Geoparks in Europe.

During that week, each Geopark organises a full programme, including many activities of all kinds and for every type of audience.

Fig. D. 21

Fig. D. 21 | Talking about Twitter event, *June 2017*

Fig. D. 22 | Talking about Twitter event, *June 2018*

Fig. D. 22

With the aim of publicising the initiative and raising awareness of its importance and characteristics, especially among the local population, a **travelling exhibition on the Granada Geopark** has been produced, and it rotates temporarily in each of the municipalities and/or schools in the territory. It is also used to **publicise** the Geopark outside the area, being easy to transfer to other places where it is required or is of interest. A **virtual version of it is also available** on the Granada Geopark website.

Signage is another essential element for communicating the messages the Geopark wishes to convey, in order to provide correct information about its resources. To give a uniform and coherent view of the territory, a **signage manual** has been compiled, to define the type of signs and information panels used for the local and regional roads, the urban environment of the municipalities in the Geopark, and the sites of geological interest and natural viewpoints.

All the signage has clear, informative content, easily comprehensible to a non-specialist audience, in Spanish and English and designed with accessibility criteria in mind.

Pocket maps, published on paper, contain information on the most important sites of geological interest, and also information on cultural heritage. They can be found in various outlets, as well as in all the museums, interpretation centres and tourist information offices in the territory.

A children's map has also been published, aimed at the youngest visitors, with general information on the activities that can be carried out in the Geopark.

Various thematic brochures and maps are also available on cultural heritage, experiences, sports routes, etc. These can be found in several languages (Portuguese, French, Italian, etc.).

The **Granada Geopark's Network of Heritage Information Centres** is another powerful tool that has helped to raise awareness of the rich and varied heritage it offers and the importance of making knowledge of it available both to the local population and to visitors. All these centres have plaques installed identifying them as centres belonging to the network.

And in all of them a space has been created offering information and documentation on the Granada Geopark. They also have a directory available containing the data on all the centres in the network, with addresses and contact information for visitors.

These centres have professional staff specifically trained in customer service and accessibility for people with disabilities, facilitating their visits. In most cases, moreover, these staff members also have training in languages.

In order to raise the profile of the Geopark among the local and provincial population, a range of **merchandising items** (T-shirts, bags, caps, etc.) have been designed and distributed and are handed out in schools and groups participating in the various activities organised by the Granada Geopark.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