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La Garrotxa Volcanic Field of Northeast Spain

Case Study of Sustainable Volcanic Landscape Management

Springer

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Preface

The Neogene-Quaternary extension-related alkaline volcanism represents one of the most significant magmatic events in Western and Central Europe since the Variscan orogeny. Primitive mafic alkaline volcanic rocks are widely distributed along an extensive rift system which comprises among others the volcanic areas of the Rhenohercynian of Germany, the Bohemian massif in Czechia, the Massif Central of France and the Catalan Volcanic Zone in the NE of Spain. From this last the La Garrotxa Volcanic Field is the best example of a volcanic landscape in the Iberian Peninsula and one of the most interesting and best preserved in continental Europe. It formed from about 700 ka to early Holocene and has around fifty well-preserved cones and more than 20 basaltic lava flows with special morphologies. This volcanic field is composed of monogenetic cones, generated during Strombolian and phreatomagmatic eruptions, which formed along tectonic fissures and faults and include a large variety of successions of deposits. After some eruptions, lava emissions blocked the drainage of some valleys and created dams. These old lakes have been covered by sediments and nowadays are fertile plains.

The industrial and urban growth experienced in the region during the 1970s led to a series of serious attacks, including a massive extraction of volcanic materials, which seriously threaten all of its natural values. This impelled different sectors of society to mobilise leaving them in 1976 to create the Promotion Committee for the Protection of Volcanic Zone and the celebration, a year later, of the Campaign for the Protection of the Natural Heritage of the Catalan Countries, organised by the Congress of Catalan Culture. Finally, the Parliament of Catalonia unanimously approved the Law 2/1982, of March 3, the protection of the volcanic zone of La Garrotxa, declaring part of it as Natural Area of National Interest, with the aim of attending the conservation of its flora, geomorphology and of its special beauty, given the uniqueness characteristics of the territory (Art. 1). This new law also declared twenty natural reserves of geo-botanical interest, in order to avoid any action that could bring to their destruction, impairment, disfigurement or the transformation of its geomorphology or flora (Art. 2). The Decree 71/1986 of 13 February, approved the specific topographic boundaries of the natural park and the natural reserves included, and describes the external perimeter of the park and the cadastral sectors included in the nature reserve. The souther sector of La Garrotxa Volcanic Field was not included in the limits of the natural park but has also received attention from the local society and administration resulting in the declaration of several natural sites with special protection as is the case of the Crosa de Sant Dalmai volcano. All this new legislation permitted to stop mining activities and to minimise and restore the ruined geological heritage through the structuring and consolidation of the natural park and other protected zones. Example of such activities is the restoration in 1995 of the Croscat volcano, the most emblematic in the park, the youngest in the Iberian Peninsula and the one that has suffered most environmental impact.

The region occupied by La Garrotxa Volcanic Field is characterised by an intimate relationship between volcanoes and society, in an extent comparable or even superior than in areas with more active volcanism. In this region volcanoes are present in many aspects of local society, as its cultural heritage, local history, architecture, or even in its excellent cuisine.

People are aware of living among volcanoes and that they represent the most characteristic feature of their region.

This is a land rich in traditions and history, with some Romanesque gems, medieval villages (Santa Pau, Besalú) and deep-rooted popular festivals, in which a sustainable tourism is promoted through an excellent network of hotels, guesthouses, farmhouses, hostels, rural apartments and camping sites and with the main aim of showing to the visitors the volcanoes and their related landscape.

La Garrotxa Volcanic Zone Natural Park has been pioneering in many initiatives addressed to preserve their landscape and natural values and to promote their knowledge among the society. This book seeks to explain all these aspects to the reader in a pleasant and enjoyable way through the La Garrotxa volcanoes. In addition to a general description of the main geological and volcanological values of the region we also include a detailed description of the history of the region, its biological diversity, and its cultural heritage including architecture, folklore and gastronomy. An important part of the book will be also dedicated to describe the educational programmes and outreach developed to disseminate the main values of this region, as well as how a sustainable tourism has been implemented and the management plan that has been designed to preserve such important natural and cultural values.

The book is written by different local experts on the different topics covered in its chapters and is addressed to a general audience interested in visiting the area but also in knowing an example of geoheritage and geoconservation with a successful integration of education, tourism, planning and environmental management. Through the different chapters of the book the reader will get a detailed view the main natural and social values of La Garrotxa Volcanic Field.

The Book Contents

The chapters included in this book provide a general but also detailed overview of the main aspects that characterise La Garrotxa Volcanic Field and that make it a most singular protected area for what concerns the integration of natural geoheritage with society. Thus, through the different chapters of the book we will learn about the geology, landscape, habitats, history and culture of this exceptional zone, as well as on the management and educational programmes that have been made possible its conservation and the dissemination of their main values among the general public.

Chapter 1 introduces the main characteristics of the volcanic landscape of La Garrotxa describing it as the dynamic combination of a series of geological, biotic and anthropic elements that have converted this area into one of the most singular scenic areas of volcanic origin. The chapter revises in detail all these aspects and provides also an introduction on the European and Catalan legal provisions regarding landscape protection, planning and management, with special emphasis on the Catalan landscape catalogues and maps, which helps to better understand the singularity of this volcanic area.

Chapter 2 describes the main geological features of the area and offers the reader an overview of the characteristics of La Garrotxa volcanism and its current scientific knowledge. It lets the reader know how the eruption sequences differ from one volcano to another, combining episodes of lava flow emission, with others of poorly explosive magmatic (strombolian) activity or with highly explosive episodes (phreatomagmatic) resulting from the interaction of the erupting magma with groundwater, and how these different eruption behaviours depend on the differing stratigraphic, structural and hydrogeological characteristics of the substrata below each volcano.

Chapter 3 helps to understand how relief, diversity of substrata, climate and its geographical position in the eastern Pyrenees, has converted La Garrotxa into a region with a fascinating biological history, characterised by a great diversity of species and habitats. It also reviews how intense anthropic disturbance has also played its part and agriculture, animal

husbandry, forestry and industry have helped increase the diversity of environments and afforded greater importance to the secondary communities and open spaces present in this region.

Chapter 4 shows how La Garrotxa is a land through which a multitude of different peoples have passed and left their mark, leaving behind a reach history in which the different periods are clearly identified by their imprinting on the human and cultural evolution of the region.

Chapter 5 complements in part to Chap. 2 and reviews the main features of the volcanism in La Garrotxa Volcanic Field trough the description of a number of selected outcrops and viewpoints of this volcanic field, also indicating how to reach them, with the aim to help readers interpret the landscape and the volcanological processes that characterise this volcanic field. Additional information on landscape, natural habitats and cultural heritage are also provided in cases where such information is particularly relevant.

Chapter 6 describes the main sites of natural and cultural or historical interest that can be visited in La Garrotxa Volcanic Field, in addition to the volcanological sites described in the previous chapter.

Chapter 7 explains the reader how the pedagogical activities carried out in this protected area have been one of the pillars to build on it a solid culture of preservation of the natural heritage. It describes how the use of the environment as a setting and as an educational resource, among other aspects, has helped to ensure the conservation of the region's geological, botanical and scenic riches.

Chapter 8 shows how in La Garrotxa sustainable tourism is being promoted via the European Charter for Sustainable Tourism, whose principles and strategies aim to promote local sustainable development, and revises what has been the economic impact of this sustainable tourism on the region.

Finally, Chap. 9 reviews the management of the geological heritage of La Garrotxa Volcanic Zone Natural Park, and includes both an evaluation of the strategy that was approved in 2004 and a discussion of the current and future work devoted to conserving the area's remarkable natural heritage and fomenting its sustainable use.

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Contents