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## Chapter

# TFgeotourism: A Project to Quantify, Highlight, and Promote the Volcanic Geoheritage and Geotourism in Tenerife (Canary Islands, Spain)

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William Hernández and Antonio Márquez*

## Abstract

Volcanic landscapes offer a multitude of resources to the communities that live within them. However, the main attraction that volcanoes offer is associated with volcanic heritage and geotourism. The scope of this project is to create and promote emerging geotouristic products through the empowerment of volcano tourism and thus contribute to strengthening the economic and business fabric of the volcanic island of Tenerife (Spain). In Tenerife, this great geodiversity includes the stratovolcanoes, shield volcanoes, calderas, cinder cones, maars, tuff cones and rings, and lava fields, all exposed beautifully in cliffs, ravines, beaches, deposits, etc. The main activities of the project associated with the documentation and quantification of the conservation values of the volcanic heritage are the following: production of a documentary on the volcanic geoheritage of Teide volcano, selection of the top 50 sites of geotouristic interest, creation of urban geotourism itineraries, recreation of the itinerary of Alexander von Humboldt, and creation of a web page for the project. This project will deliver an essential resource needed to diversify the leisure activities offered in Tenerife through the volcanic heritage and geotourism. It quantifies the best that Tenerife can uniquely offer and highlights it in a globally accessible and perpetual manner.

**Keywords:** volcanoes, volcanic geoheritage, geomorphosites, geotourism, urban geotourism, Tenerife, Spain

## 1. Introduction

There are some major transformations taking place in mature tourist destinations. These destinations correspond to the places with large tradition on touristic activities and situate in the mature or decline phases of the cycle of life of touristic destination [1] to refer the sun and beach tourism as Tenerife Island. These are the results of both the obsolete nature of tourism services, equipment, and infrastructures, as well as changes in the profile of demand for more sustainable products.

Both transformations have motivated tourism agents to seek innovative, creative, and imaginative solutions that prevent the decline of destinations and that represent a claim for visitors. The main examples are the changes in the touristic laws associate to the sustainability concept, the transformation of the urban spaces in the private and public places in the touristic cities, and the creation of the new touristic products such as geotourism. In this sense, within these new motivations, the diversification of the offer in the destination is being key. Therefore, the creation of new tourism products and experiences has become one of the main challenges for mature destinations to continue to occupy a significant role in the world tourism map at a time when the tourism sector is being very dynamic.

Within the diversity of new products and tourist experiences that are being developed in many parts of the world [2–3], is geotourism. Although it is true that in its landscape and esthetic conception, relief was present in the declaration of the first national parks in the world such as Yellowstone, Grand Canyon, etc., and in Spain (Picos de Europa, Teide, etc.), it is not until recent times geotourism has increased significantly [4–7], contributing to the creation of the European and global networks of geoparks in the last 20 years. Therefore, geotourism is a relatively modern term that was implemented in the modern society but welcomes multiple initiatives in different places and from different geological and geographical approaches, but they do not have to be mutually exclusive [7–8].

The island of Tenerife is an international tourist destination whose main attraction is the sun and the beach that attracts millions of visitors every year. However, Tenerife has a great variety of natural resources and tourist attractions that could diversify its offer and be the claim of other types of tourists [9]. In this sense, this chapter shows the main results of the project “Tfgeotourism: strengthening the economic and business fabric linked to the tourism sector of Tenerife by promoting volcanotourism,” whose objective is to create different geotourism products and experiences that contribute to diversifying the offer of leisure activities on the island and that can be implemented by tourism companies that already exist in Tenerife or that may be created as a result of this offer of volcano tourism products.

Therefore, the general objective and the main results of this project are in accordance with the objectives of the Global Geopark Network (GGN) to develop a leisure offer supported by geotourism that contributes to diversifying tourism and traditional economic activities in Tenerife through the creation of innovative local companies, new jobs, and highly qualified training courses for the different tourism agents [10]. But at the same time, Tfgeotourism is also in line with some of the objectives proposed by the Geoparks Commission of the International Geographical Union (IGU), which relates them to their role as a tool to communicate, recreate, and conserve nature or to understand the wide range of processes that affect the sustainable development of geoparks, including the natural environment, political, and socioeconomic processes [11].

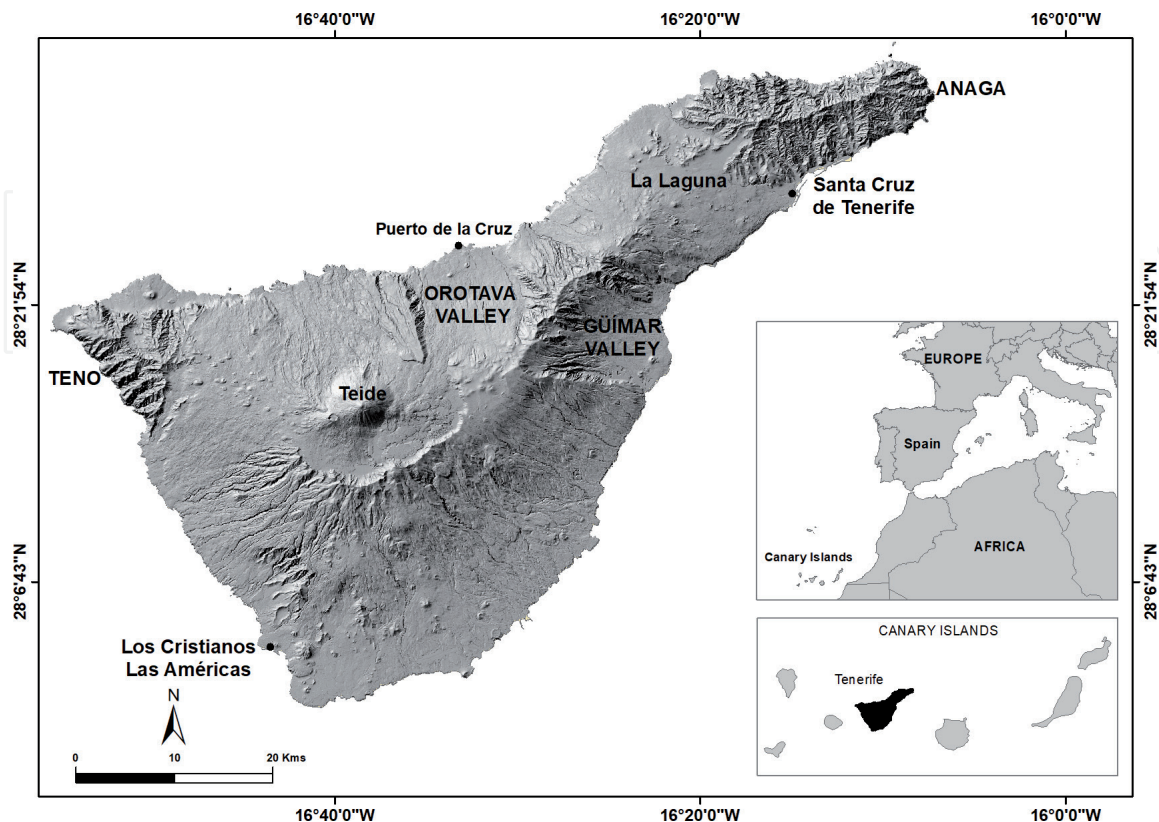
In this sense, the choice of volcanic geotourism within the diversity of new tourism products and experiences in Tenerife responds to several reasons: 1. The island is a consolidated and well-known international destination to which several million tourists arrive annually. 2. The volcanic landscape of the island is diverse and, in it, practically all the forms and eruptive processes can be recognized, giving rise to one of the most geodiverse volcanic spaces from the point of view of the geological and geomorphological heritage [12]. 3. Tenerife already has a geotourism offer in some places such as the Teide National Park, being the most visited park in the Canary Islands and Spain, with an average of about 3 million annually [13–14], and also in other places such as Barranco de Masca, the Macizo de Anaga, or the volcanic tube of La Cueva del Viento. 4. A large part of the insular volcanic geoheritage is not being exploited for tourism, because the principal activities associate

to the geotourism focused in the national park and some natural protected areas.  
5. The practice of geotourism does not necessarily require a specialized public, which makes it very attractive and feasible for all tourists and visitors who come to Tenerife.

## 2. Tenerife a laboratory for the volcano tourism

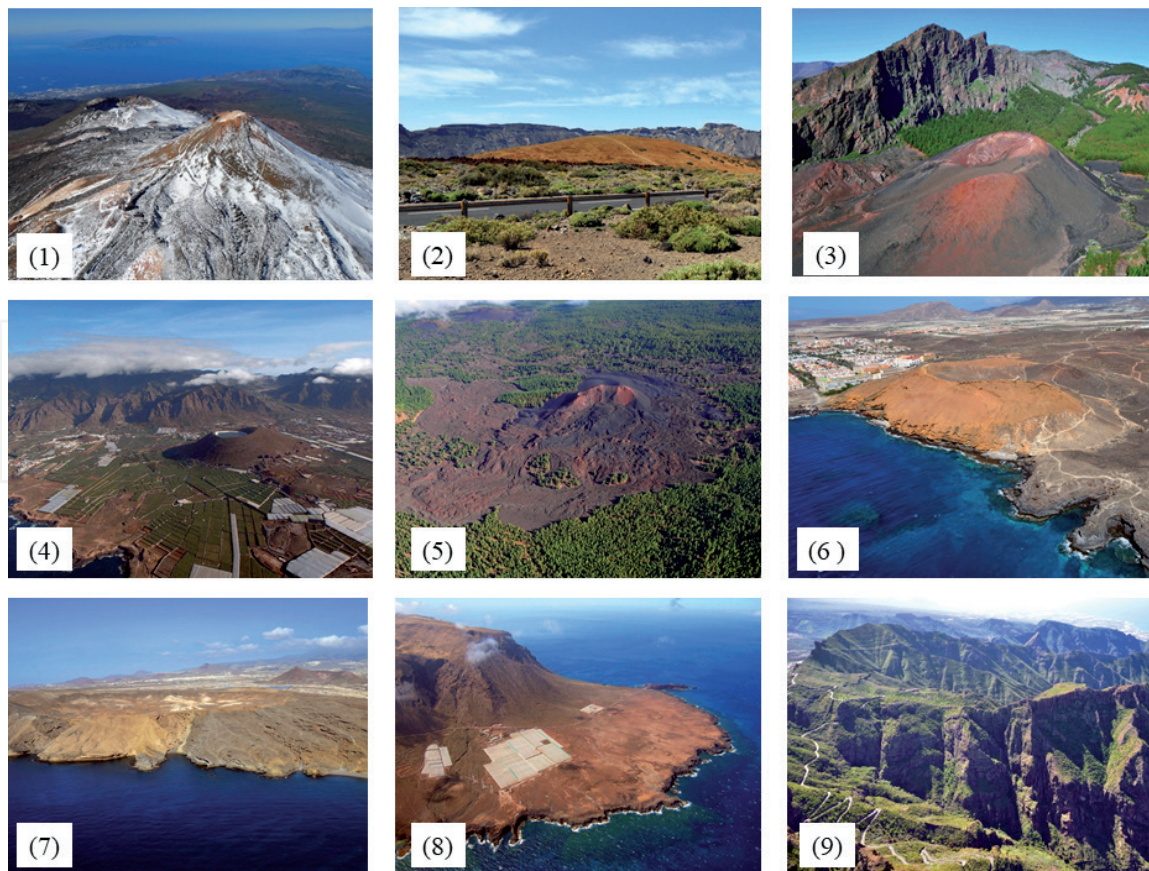
Tenerife is the largest (2034 km<sup>2</sup>) and highest (3718 m a.s.l.) island of the Canary archipelago (**Figure 1**). It has been built up as a result of the accumulation of a wide variety (mafic, felsic) of fundamental volcanic materials in a relatively short period of time, which results in a world-unique variety of volcano-related tourism features in an accessible scale. In Tenerife, this great geodiversity includes the stravalcanoes, shield volcanoes, calderas, cinder cones, maars, tuff cones and rings, and lava fields, all exposed beautifully in cliffs, ravines, beaches, deposits, etc. (**Figure 2**). This volcanic geodiversity is a nonrenewable heritage [15] with various main characteristics associated with its natural and cultural heritage [16, 17]. The diversity of forms and processes of relief both directly related to volcanism as well as erosion and accumulation make up the volcanic heritage [18] and are responsible for the geodiversity of volcanic geoheritage of Tenerife Island.

Tenerife is one of the main tourist destinations in the world in relation to the number of accommodation places (>137,000 in September 2019) and the number of visitors it receives, which in 2019 exceeded 5 million [19]. We must also add the local visitors and hikers who increase this number. In turn, Tenerife has a great variety of new tourism products and experiences (geotourism, astrotourism, gastronomic, sports, health, bird watching, sailor, hiking, diving, whale watching, etc.), which are associated with diversity of attractions that the island has. Therefore, Tenerife has a diversified tourist offer capable of responding to this increasingly informed,



**Figure 1.** Location of Tenerife volcanic island. Source: Own elaboration from the DEM base of Grafcan.





**Figure 2.**

*Different volcanic landscapes of Tenerife. (1) Teide and Pico Viejo stratovolcanoes. (2) Las Cañadas caldera and Majua dome. (3) Arafo historical eruption. (4) cinder cone of Montaña taco. (5) last eruption of Tenerife: Chinyero cinder cones (1909). (6) Montaña Amarilla tuff cone and Bandas del Sur pumice formation. (7) Montaña Pelada tuff ring and monogenetic volcanic field. (8) Punta de Teno lava delta. (9) ravines in Teno shield volcanism.*

demanding, and active demand, which makes the island an ideal destination for the introduction of new tourism products and experiences such as geotourism.

### 3. TFgeotourism: Tenerife's volcano tourism project

Tfgeotourism Project started in 2017, thanks to the financing of the Island Council of Tenerife. The entity responsible for executing it is the Instituto Volcanológico de Canarias (INVOLCAN). INVOLCAN, an entity unanimously demanded by the Senate (11/02/2005), the Parliament of the Canary Islands (01/11/2006), and the Congress of Deputies (12/02/2009), aims to contribute to the improvement of volcanic risk management in Spain (say the Canary Islands; the only volcanically active region of the national territory of Spain with volcanic risk) and the optimization of the management of the many benefits that come with living in a volcanic territory (geothermal resources, geotourism, etc.). Its mission and vision are intended to contribute to the sustainable development of the Canary Islands as well as other volcanic regions.

Within the TFgeotourism project and in accordance with its objectives, different products have been created associated with volcano tourism. This type of tourism in Tenerife constitutes a relatively new modality that consists of the tourist exploitation of natural and cultural aspects directly or indirectly linked to volcanoes. In this sense, the geotourism interest of volcanoes is associated with three fundamental aspects: (1) the landscapes they generate where the esthetic beauty of the processes

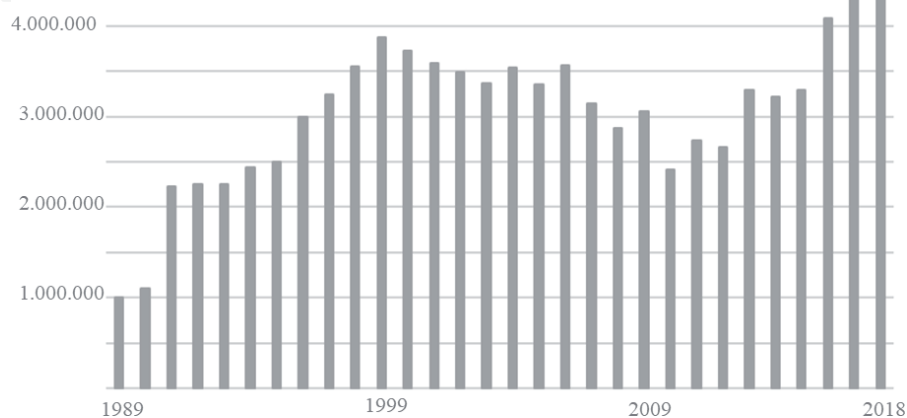
and forms cannot be compared to other geological territories; (2) the cultural aspect of volcanoes in relation to the societies that agree with them (archeology, history, music, folklore, gastronomy, etc.), configuring volcanic landscapes as key elements and icons in the culture of the peoples that coexist with them and its surroundings; and (3) the possibility of experiencing the power of seeing an erupting volcano as long as the safety of visitors is guaranteed.

Associated both with the objective of the project and with the geotourism interest of the volcanoes, TFgeotourism has created various products and tourist experiences that diversify both the leisure offer of Tenerife as well as geotourism. Each of the products generated within the project and whose purpose is to strengthen the economic and business fabric of the island are listed and characterized below.

### 3.1 Documentary on the volcanic geoheritage of Teide volcano

The need to make a documentary exclusively about the volcanic geoheritage of Teide volcano responds both to its international importance and to the fact that it had not been done until now. The global relevance of this volcano is due to the following facts: it is the National Park that receives more tourists in Spain (**Figure 3**) and is one of the most visited volcanic areas in the world [20]; it was part of the 16 volcanoes of the decade in 1990 according to the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) for the reduction of natural disasters; and it was one of the five European volcanoes (European Laboratory Volcanoes: Teide) of the European Commission, and since 2007, it has been a UNESCO World Heritage Site. To all these recognitions that value the volcanic heritage of the national park through its rich geoheritage, we must also add its varied and unique biodiversity and its rich cultural heritage from pre-Hispanic times to the present day [21].

Therefore, despite the relevance of its geoheritage and its tourist importance (international, national, and local), the national park did not have a specific and easily acquired tourist product for visitors who are attracted by the geotourism of Teide volcano. In this way, the documentary (**Figure 4**) that has been made is entitled "Teide, the sleeping giant"; it lasts for about 30 min, and throughout it, each and every one of the natural elements and cultural that make up the geodiversity of volcanic geoheritage of Teide volcano are displayed: stratovolcanoes, domes, cinder cones, hornitos, craters, lava flows, lava tubes, ravines, periglacial forms, and processes.



**Figure 3.** Visitors to Teide National Park. Source: ISTAC; Istac: <http://www.gobiernodecanarias.org/istac/>. Own elaboration.





**Figure 4.** Some photographs about the shooting of the Teide documentary with drones. All pictures show the Teide and Pico Viejo stratovolcanoes and Roques Blancos lava dome. Source: Alas.

The documentary was presented in 2019 at the twenty-first edition of the Canary Islands International Medium-Environmental Film Festival (FIMEC) in Garachico, in the north of Tenerife, with a large influx of audiences. From there, it has been screened in various municipalities on the island (La Orotava, Guía de Isora, Los Realejos, etc.) and the objective is that it can be screened in all of them.

### 3.2 Tenerife's geoturistic guide

This is Tenerife's first geotourism guide (**Figure 5**). The main objective is to show the diversity of the volcanic geoheritage of Tenerife through the selection of various places that collect aspects of its geodiversity, its geoheritage, and its geoconservation. According with the more geographical vision of geotourism, the places listed in the guide show the values of the natural and cultural heritage associated with volcanoes. In this sense, and in addition to the geological and geomorphological heritage, aspects related to the vegetal landscape, the ornithological importance, the panoramic views or the cultural legacy that anthropic uses have left on the landscape are pointed out when using materials from the gea for the farming, the stone roads or the traditional buildings.

The guide has a selection of 50 places of geotourism interest Tenerife [22] (**Figure 6**) corresponding to the geological context of buildings and volcanic morphologies of the Canary Islands defined according to the Geological Survey of Spain (IGME). With the purpose of a greater understanding, the information of each place is presented in a file format. This has several sections in which the name of the geotourism place of interest and its UTM coordinates appear; the geological context and its main interest (tectonic, morphological, stratigraphic, and petrological); the municipality to which it belongs and its numbering; the location map; its description; the conservation and uses in it in order to establish what can and



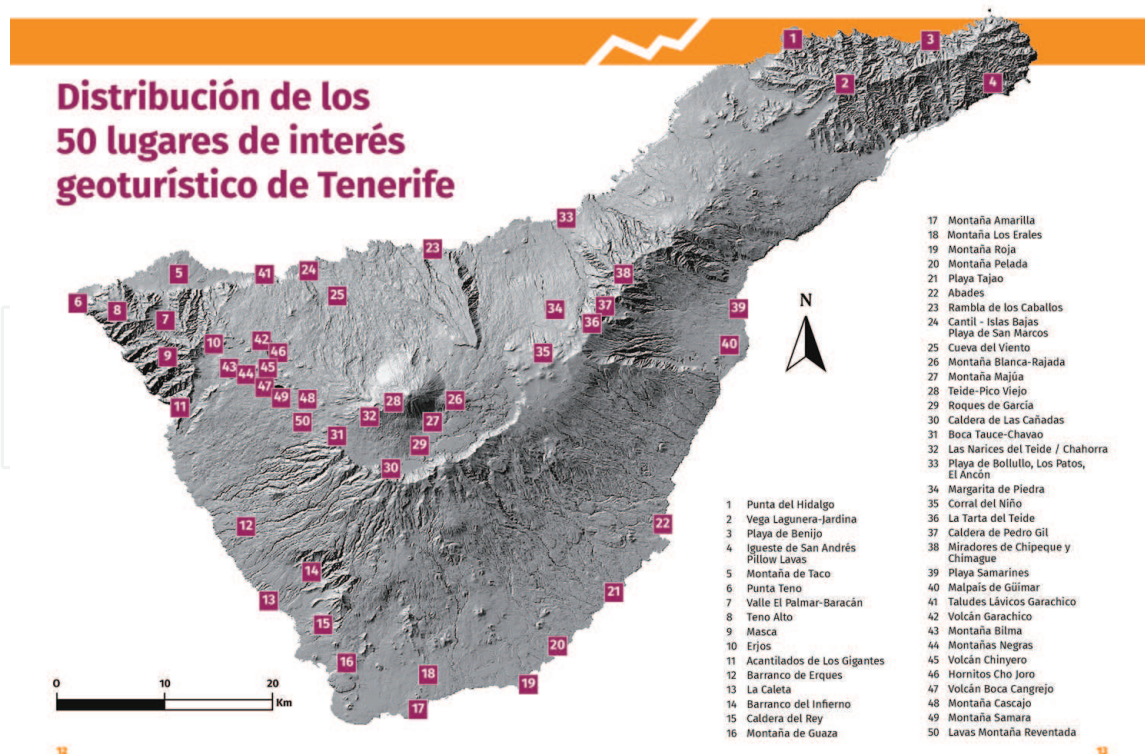


**Figure 5.**  
*Tenerife geotourism guide. Source: <http://tfgeoturismo.involcan.org/>.*

cannot be done; the trails that run through each place; and the selection of the main geotourism interests of the site and the bibliographic references where you can find more information about each of the places included in the guide.

The set of 50 geotourism sites selected from the guide represent the geodiversity and volcanic geoheritage of the island of Tenerife from the topographic, volcanic, morphological, and landscape point of view [22, 23]. Topographically, the two slopes (north and south) and the different altitude levels of the island are represented. Volcanologically, the 50 places are distributed by all the volcanic buildings of Tenerife (shield volcanism-ancient volcanic massifs, rift volcanism and the central complex Cañadas-Pico Viejo-Teide), they represent both magmatic and hydromagmatic volcanism and the different dynamics and behavior eruptive (effusive, explosive and mixed). Morphologically, the places are part of both the forms and processes of direct volcanism (eruptions, volcano fields, lava fields, stratovolcanoes, etc.) and the processes of erosion and accumulation (ravines, cliffs, beaches, dunes, slopes, etc.). And, finally, from the landscape point of view, an attempt has been made that





**Figure 6.** Spatial distribution of the 50 sites of geotourism interest. Source: <http://tfgeoturismo.involcan.org/>.

places of geotourism interest are present in all the large landscape units defined for Tenerife, which are the result of the combination of topographic, volcanic, biogeographic, and cultural criteria (landscapes of coastline with beaches and/or cliffs with xeric vegetation, embedded and open ravines with laurel and pine forests, badlands and lajiales without vegetation, volcanoes and lava with pine forests, stratovolcanoes of peaks with high mountain scrub, etc., and on which you cannot ignore all their cultural baggage) such as farming, traditional villages, churches, etc. In order to make the selected places accessible, it has also been tried that they are always within the usual itineraries (routes and circuits) of visitors to the island [23].

### 3.3 Urban geotouristic itineraries

In most cases, geotourism products, experiences, and activities are designed to be carried out mainly in protected natural areas. However, geotourism initiatives within cities are gaining more and more interest [24–26]. In this sense, the urban geotourism is a type of tourism which concentrates on the exploitation of the attractive parts of the relief of the cities. To do so, it is necessary to identify the places, areas, and/or elements with a geological-geomorphological interest (geosites or geomorphosites) and then design geotouristic itineraries which can be of chronological, geological, or spatial interest. The geographical relief can be found in any particular location within the city, either natural (volcanoes, lava flows, ravines, cliffs, beaches, etc.), which means those that have not been occupied by urban constructions, or those belonging to the cultural heritage (roads, buildings, etc.). The urban geotourism is recommended to a very diverse public, from local residents to visitors attracted by the geological heritage.

Within the TFgeotourism Project, 23 urban geotourism itineraries were designed in the different municipalities of Tenerife (Figure 7). In each of them, the natural geotourism sites and cultures of the cities and their environments were





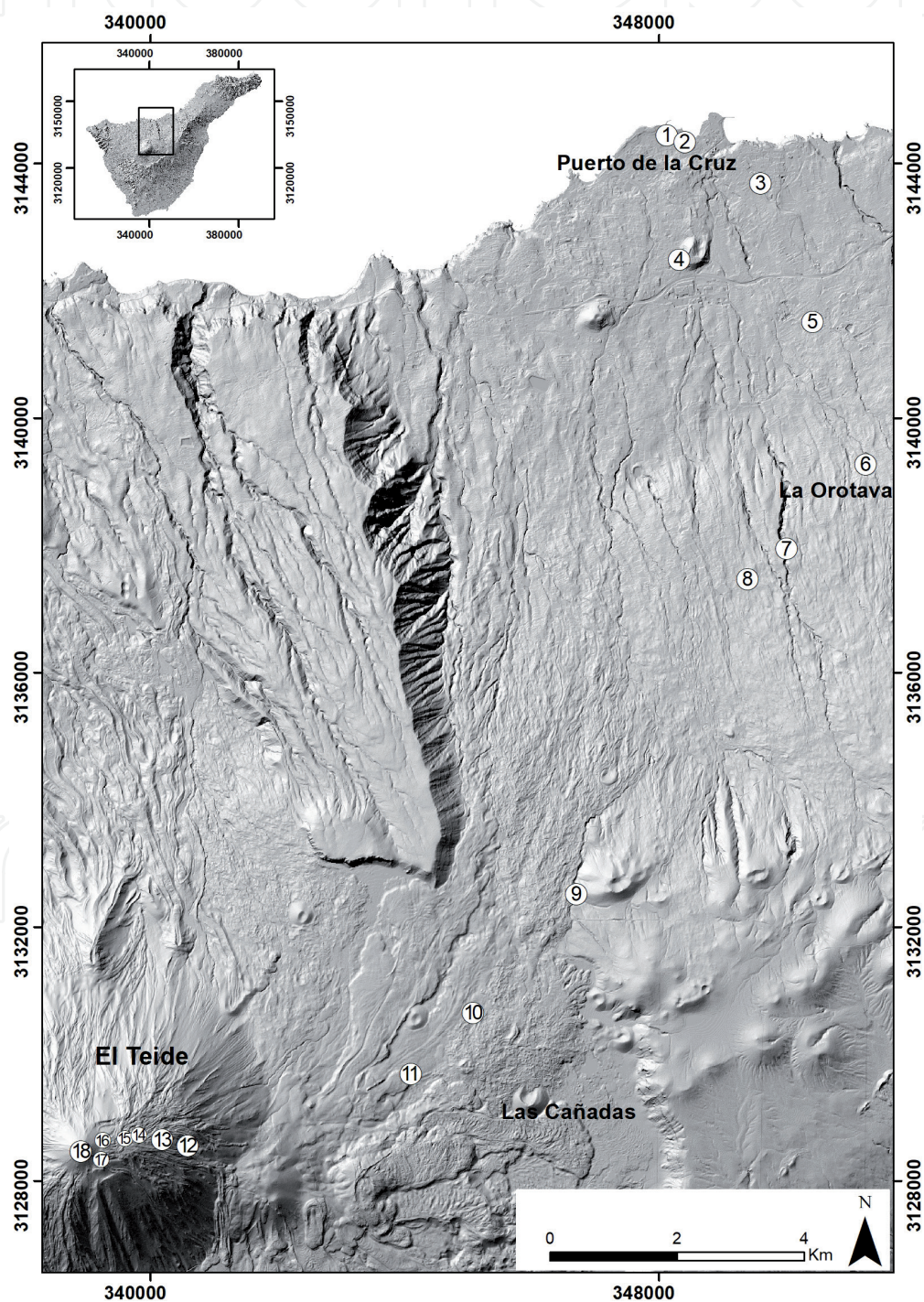
Figure 7.  
 Example of an urban geotourism itinerary. Source: <http://tfgeoturismo.involcan.org/>.

identified, selected, inventoried, and characterized [27]. The information of each site was collected in a file whose objective is to provide more information on the places selected to make the route. The itineraries are always developed through the cities, they are easily accessible, with little unevenness, they can be developed at any time of the year given the subtropical climate of the island, the duration varies between 1.5 and 3 h and the number of places and stops is not more than 16.



### 3.4 Geoturistic itinerary of Alexander von Humboldt in Tenerife

On June 19, 1799, the German naturalist Alexander von Humboldt made a stop in Tenerife with the aim of ascending the Teide volcano [28]. The traveler made various observations, descriptions, and measurements of the places he visited. Among the varied information that he left us, stand out his impressions of the natural and cultural heritage associated with the volcanic landscapes through which the route ran from Puerto de la Cruz to the top of Teide stand out. In this sense, his interesting observations have allowed us to identify the 18 stops into which the journey was divided and to show the tourist interest of each one of them. In addition, given the importance of travel literature for experience tourism and the geoturistic interest



**Figure 8.** Special identification of Humboldt stops on his ascent to Teide. Source: Own elaboration from the DEM base of Grafcan.

of the stops on the route (**Figure 8**), it has been possible to recreate almost exactly the itinerary that Alexander von Humboldt made through the Orotava Valley and the Cañadas del Teide.

**Table 1** shows the 18 stops identified and their geotourism attractiveness divided between natural and cultural heritage. The attractions refer both to the impressions taken by the German traveler in June 1799 and to those that can be observed today when the tour is made [29].

N°	Stop	Geotouristic attractions
1	Puerto de La Orotava (Puerto de la Cruz)	Coast of La Paz, hornitos and scorias cones at Tigaiga eruption, Teide, clouds sea, taste for nature, lyrics, music, and San Juan festival in Sitio Liter
2	Casa familia Cologan (Hotel Marquesa)	Basaltic volcanic rocks: lavas, lapilli, etc.
3	Jardín Aclimatación (Jardín Botánico)	Topographic terrace, plants, natural source, climate
4	Volcanes Fraile y Horca	Geology and geomorphology, volcanic cones, craters, lavas, volcanic ash, lapilli, pumice, basalts, eruptions, vegetation, guanches, and rural landscapes
5	Villa de La Orotava	Topography, geology, hills-watersheds, climate, mist, waters, vegetation, dragon tree, ferns, fauna, guanches, noble houses, aqueducts, mills, crops, vineyards, fruit trees, and peasants
6	Monte de los Castaños	Cobbled path, chestnut trees, laurel forest, heather, and ferns
7	Pino Dornajito	Panoramas of the north of Tenerife, rugged topography, mountainous area, volcanic mountains, volcanic cones, lava, small ravines, porous rocks, water spring, vegetation, pine trees, and footpath
8	Monteverde	Heather, fern, fern-rooted gofio, humble town, and misery
9	Portillo	Volcanoes, basalts, volcanic cones, caldera, and pine forests
10	Cañadas Occidentales-Volcán M. Corrales	Topographic plain, plateau, pumice fields, sands, Teide, lava flows, eruptions, broom thickets, summit vegetation, hunters, and straw hats
11	Roque de Gaita	Volcanoes, black streams, obsidian blocks, rocks, rabbits, and goats
12	Estancia de los Ingleses-Montón del trigo	Black streams, ravines, plateaus, lava blocks, caves, Teide, climate, gorse, horses, mules, bonfires, and pine torches
13	Altavista	Topography, slopes, escarpments, lava, snowfields, snow, mules, and indigenous
14	Malpaís (cueva del Hielo)	Malpaís, lavas, path, perpetual snow, glacier, cave, volcanic tubes, jameos, sea of clouds, and ice collection
15	Senda coladas negras	Black lava flows, aa, malpaís, python, sea of clouds, vision of other islands, sunrise, laziness of the guides, and guanches
16	Rambleta	Topographic plain, python, Narices del Teide, and fumes-gases
17	Pitón	Topography, slopes, lavas, python, lavas, cooling sidewall, ash, pumice, slag, snow, and groundwater
18	Cráter terminal	Small crater, lava flows, slags, ashes, slopes, sensation of cold, roaring fumaroles, Teide violet, climate, sky, bees, feeling of loneliness, and Malvasia wine

**Table 1.** Identification of the attractions with geotourism interest in the stops made by Humboldt from the port of La Orotava to Teide.



### **3.5 Web page of TFgeotourism project**

With the aim that all the products produced within the TFgeotourism project are freely consulted and available to everyone, a web page was created (<http://tfgeoturismo.involcan.org/>). In this, in addition to the fact that you can view all the products generated and download them in digital format, you can consult additional information on the geotourism places of interest or the different urban geotourism stops.

## **4. Conclusions**

This chapter shows the different volcano tourism products created within the TFgeotourism project for the island of Tenerife. This Spanish island is one of the main tourist destinations in the world for both the number of tourist places it offers and the millions of tourists it receives each year. The main tourist attraction on the island is the sun and the beach. However, in Tenerife, there is a great variety of tourist resources that could diversify its leisure offer, helping to avoid or minimize some of the problems that mature sun and beach tourist destinations are having. Within the variety of new tourism products and experiences that can be recognized in Tenerife, geotourism associated with volcanoes is one of them. The TFgeoturismo project aims to create different geotourism products to strengthen the economic and business fabric of the island. In this sense, this chapter indicates and characterizes the main activities of the project associated with the documentation and quantification of the conservation values of the volcanic heritage, as follows: (1) production of a documentary on the volcanic geoh heritage of Teide volcano; (2) identification, inventory and selection of the top 50 sites of geotouristic interest on the island associate to geomorphosites; (3) creation of urban geotourism itineraries in the different municipalities of the island of Tenerife; (4) recreation of the itinerary of the pioneering German naturalist, Alexander von Humboldt, from Puerto de La Cruz to the top of the Teide volcano; and (5) creation of a web page for the project (<http://tfgeoturismo.involcan.org/>) that showcases all the geotouristic products generated within the framework of the project. Therefore, this project will deliver an essential resource needed to diversify the leisure activities offered in Tenerife through the volcanic heritage and geotourism. It quantifies the best that Tenerife can uniquely offer and highlights it in a globally accessible and perpetual manner.

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## **Conflict of interest**

The authors declare no conflict of interest.

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## References

- [1] Butler R. The concept of a tourist area cycle of evolution: Implications for management of resources. *Canadian Geographer*. 1980;24(1):5-12. DOI: 10.1111/j.1541-0064.1980.tb00970.x
- [2] Joyce EB. Australia's geoheritage: History of study, a new inventory of geosites and applications to geotourism and geoparks. *Geoheritage*. 2010;2:39-56. DOI: 10.1007/s12371-010-0011-z
- [3] Alessio G, De Lucia M. Promotion and development of protected volcanic areas through field-based environmental communication activities: The "gran Cono" tour in the Vesuvius National Park (Italy). *Geoheritage*. 2017;9:435-442. DOI: 10.1007/s12371-017-0242-3
- [4] Farsani N, Coelho C, Costa C, Amrikazemi A. Geotourism and geoparks as gateways to socio-cultural sustainability in Qeshm rural areas, Iran. *Asia Pacific Journal of Tourism Research*. 2012;17(1):30-48. DOI: 10.1080/10941665.2011.610145
- [5] Ólafsdóttir R, Dowling R. Geotourism and geoparks-a tool for geoconservation and rural development in vulnerable environments: A case study from iceland. *Geoheritage*. 2014;6(1):71-87. DOI: 10.1007/s12371-013-0095-3
- [6] Ruban D. Geotourism-a geographical review of the literatura. *Tourism Management Perspectives*. 2015;15:1-15. DOI: 10.1016/j.tmp.2015.03.005
- [7] Dowling R, Newsome D. Geotourism: Definition, characteristics and international perspectives. In: Dowling R, Newsome D, editors. *Handbook of Geotourism*. Cheltenham: Edward Elgar; 2018. pp. 1-22. DOI: 10.4337/9781785368868.00009
- [8] Pásková MZ. Sustainability management of Unesco global geoparks. *Sustainable Geoscience and Geotourism*. 2018;2:44-64. <https://www.scipress.com/SGG.2.44>. DOI: 10.1016/j.pgeola.2012.07.003
- [9] Dóniz-Páez J. Aplicación De Metodologías Docentes Al Estudio De Nuevos Productos Turísticos En Destinos Maduros: El Ejemplo De Tenerife (Canarias, España). In: Ravelo A, Pérez S, Alonso J, Canino J, Travieso C, Cruz D, editors. *III Jornadas Iberoamericanas de Innovación Educativa en el ámbito de las TIC*. Las Palmas de Gran Canaria: ULPGC; 2016. pp. 381-384
- [10] Global Geoparks Networks [Internet]. 2004. Available from: <http://www.globalgeopark.org/aboutGGN/51.htm> [Accessed: 01 August 2020]
- [11] Commission on Geoparks [Internet]. 2008. Available from: <http://www.igu-cog.org/vision.htm> [Accessed: 01 August 2020]
- [12] Dóniz-Páez J, Rodríguez F, Becerra-Ramírez R, González E, Escobar E. Geodiversity, geoheritage and volcano tourism in natural protected areas of Tenerife (Canary Islands, Spain). *Geophysical Research Abstracts*. 2018;20:EGU-15572-1
- [13] Dóniz-Páez J, Becerra-Ramírez R. Geoturismo volcánico en el Parque Nacional de Las Cañadas del Teide (Tenerife, Canarias, España). *Bloc de las Islas Canarias*. 2019;9:99-109
- [14] Dóniz-Páez J, Becerra-Ramírez R, González-Cárdenas E, Rodríguez F. Volcanic geomorphosites and geotourism in Las Cañadas del Teide National Park, Tenerife, Canary Islands, Spain. *Geophysical Research Abstracts*. 2017;19:EGU-15561
- [15] Wang L, Tian M, Wen X, Zhao L, Song J, Song M, et al. Geoconservation and geotourism in Arxan-Chaihe

- volcano area, inner Mongolia, China. *Quaternary International*. 2014;**349**:384-391. DOI: 10.1016/j.quaint.2014.06.024
- [16] Gravis I, Németh K, Procter JN. The role of cultural and indigenous values in geosite evaluations on a quaternary monogenetic volcanic landscape at Ihumātao, Auckland volcanic field, New Zealand. *Geoheritage*. 2017;**9**:373-393. DOI: 10.1007/s12371-016-0198-8
- [17] Kelley D, Page K, Quiroga D, Salazar R. In the Footsteps of Darwin: *Geoheritage, Geotourism and Conservation in the Galapagos Islands*. Switzerland AG: Springer Nature; 2019. p. 183. DOI: 10.1007/978-3-030-05915-6\_5
- [18] Németh K, Casadevall T, Moufti MR, Martí J. Volcanic geoheritage. *Geoheritage*. 2017;**9**:251-254. DOI: 10.1007/s12371-017-0257-9
- [19] Instituto Canario de Estadística [Internet]. 1991. Available from: <http://www.gobiernodecanarias.org/istac/> [Accessed: 01 August 2020]
- [20] Erfurt-Cooper P. Volcanic tourist destinations. In: *Geoheritage*. Springer Verlag, Berlin, Heidelberg: Geoparks and Geotourism Series; 2014. p. 384. DOI: 10.1007/978-3-642-16191-9
- [21] Martínez de Pisón E, Arozena M, Beltrán E, Romero C. Los paisajes del Parque Nacional del Teide. In: *Organismo Autónomo de Parques Nacionales*. Madrid. vol. 9. 2009. p. 203
- [22] Dóniz-Páez J, Hernández W, Przeor M. Lugares de interés geoturístico de Tenerife (Islas Canarias, España) como estrategia para potenciar el volcanoturismo. In: Martín-González E, Coello Bravo J, Vegas J, editors. *Actas de la XIII Reunión Nacional de la Comisión de Patrimonio Geológico*. España, Madrid: IGME; 2019. pp. 93-102
- [23] Dóniz-Páez J, Hernández W, Przeor M, Pérez N. Guía geoturística de Tenerife. In: *Involcan, S/C de Tenerife*. 2019. p. 113
- [24] Pica A, Vergari F, Fredi P, Del Monte M. The Aeterna Urbs geomorphological heritage (Rome, Italy). *Geoheritage*. 2016;**8**(1):31-42. DOI: 10.1007/s12371-015-0150-3
- [25] Reynard E, Pica A, Coratza P. Urban geomorphological heritage. An overview. *Quaestiones Geographicae*. 2017;**36**(3):7-20. DOI: 10.1515/quageo-2017-0022
- [26] Aparecida Del Lama E, De La Corte Bacci D, Martins LD, Gloria Motta García M, Kazumi L. Urban geotourism and the old Centre of São Paulo City, Brazil. *Geoheritage*. 2015;**7**(2):147-164. DOI: 10.1007/s12371-014-0119-7
- [27] Dóniz-Páez J, Becerra R, Carballo M. Propuesta de itinerario geoturístico urbano en Garachico (Tenerife, Canarias, España). *Investigaciones Geográficas*. 2016;**66**:95-115. DOI: 10.14198/INGEO2016.66.06
- [28] Humboldt A. Viaje a las regiones equinocciales del nuevo Mundo: Las Canarias y otros escritos. La Laguna: Fundación Canaria-Alemana Alexander Von Humboldt, Nivaria; 2005. p. 353
- [29] Dóniz-Páez, J. y Rodríguez Méndez, C. Propuesta de itinerario turístico en Tenerife a partir del viaje de Humboldt en 1799 desde Puerto de la Cruz al Teide. *Coloquios de Historia Canario Americana*. 2017;**XXII**-155:1-12