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## Geoproducts – innovative development strategies in UNESCO Geoparks: concept, implementation methodology, and case studies from Naturtejo Global Geopark, Portugal

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### Abstract

Since the appearance of Geoparks in 2000, geoproducts have been a strategy for local development and innovation in these territories, intimately associated with geotourism. Most of the Geoparks have their own approaches and strategies to local products and many have started to develop geoproducts in the early stages of the application processes to UNESCO. However, the definition of geoproduct remains variable and unclear. In this study we review the different concepts of geoproducts and strategies for their development used in UNESCO Global Geoparks (UGGs) and present the approach of the Naturtejo UGGp developed for over 14 years, defining geoproduct categories and case studies. This comprehensive analysis has demonstrated that geoproducts are strategic for local development and geotourism activity in UGGs. Best practices from UGGs allowed us to create a systematic methodology for geoproduct implementation in Naturtejo Geopark.

**Keywords:** geoproduct, geodiversity, UNESCO Global Geoparks, local development, geotourism, Naturtejo UNESCO Global Geopark

### 1. Introduction

Geoproduct can be defined as a commercial service or manufactured article inspired in geodiversity. The entrepreneurship of geoproducts has been intimately related with outstanding geological features marking the landscape. With the network cooperation among territories to provide sustainable development to local communities based on their geoheritage, which led to the European Geoparks Network in 2000 and later to Global Geoparks Network in 2004, geoproducts became deeply related to Geoparks initiatives. Naturtejo UNESCO Global Geopark started to foster the creation of geoproducts by local company partners since its early beginning in 2006, in a slow, complex process, with some difficulties to introduce the concept among local entrepreneurs, when only few other Geoparks were developing their geoproducts (Rodrigues & Neto de Carvalho, 2009). The lack of examples and best practices made the process mostly empirical and experimental. On the other hand, the concept of

geoproduct is still not universal, lacking to clarify the essential principles and requirements. Over time, Geoparks have been creating their own strategies, each one with its concept, its criteria and frameworks. Extremely interesting geoproducts were appearing, with innovative communication and marketing approaches, strengthening the connection with geodiversity and geoheritage and enriching the tourist experience. Geoproducts are nowadays more widespread among UNESCO Global Geoparks, with very well-established projects.

Naturtejo Geopark has a highly consolidated strategy for the development of geoproducts, resulting from 14 years of experience and constant learning from UNESCO Global Geoparks (UGGPs) best practices and from a close cooperation with local producers and stakeholders. A better clarification and greater systematization of the geoproduct concept can be an asset in the development of these territories, promoting the tourism development of each Geopark and fostering the UNESCO Global Geopark destination brand. The present study introduces examples of geoproduct implementing strategies from UNESCO Geoparks all over the world and, also, how geoproducts may contribute to these territories achieve the United National Sustainable Development Goals 2030.

## **2. Geoproducts**

### **2.1 The concept of Geoproduct**

Geoproducts are innovative, new or reinvented traditional purchasing products, which are intimately related with, or inspired by the geodiversity of a territory (Rodrigues & Neto de Carvalho 2009; Neto de Carvalho & Rodrigues, 2017; Rodrigues et al. 2017a). As geodiversity has inspired landscape appreciation, art, architecture, literature and poetry (Gordon 2012), it also provides raw materials, ideas and experiences for the creation and marketing of commercial innovative products and businesses. As soon as the concept of geopark appeared, so did appear the concept of new handicrafts with geological connotation, like fossil casting and souvenirs (Patzak & Eder 1998; UNESCO 1999). After over 20 years, geoparks have stimulated the creation of innovative strategies for local development, including the design and marketing of geoproducts, generating new sources of revenue (Eder & Patzak 2004).

As innovative products, geoproducts can actively contribute for the growth of local economies with an important role in the geotourism offer, providing new experiences and long lasting memories to geotourists (Rodrigues & Neto de Carvalho 2009). Geoproducts may also combine traditional products with new concepts and interpretations. The geoproducts can be used as territorial marketing strategies (Neto de Carvalho & Rodrigues 2010) to promote local identity and prolonging in time a great experience, a way of “bringing the Geopark Home” (Rodrigues et al. 2017a). The clear identification of geoproducts is important for the tourism development of a territory (Compl’ova 2010).

Geoproducts are produced by local communities (Geopark’s partners) and they encourage the local economy, being deeply connected with the Geopark’s territory (Popa et al. 2018; Andrasanu & Ciobaru 2018, Yuliawati et al. 2019a).

Besides contributing to foster new economic activities for locals, geoproducts educate tourists and popularize geosciences (Farsani et al. 2011, 2012a, 2017, 2018), through the symbolic representation of the Geopark’s geoheritage (Farsani et al. 2012b). For

this motive, they include tangible and intangible heritage (Danube GeoTour 2017). They have a deep connection with local geoheritage and a strong sense of identity; each geoproduct represents a story about people and the territory (Andrasanu & Ciobanu 2018).

It is recommended that the balance between the intangible value of a geoproduct (story, connexion to local identity and symbolic values) and its practical aspects (like the economic viability, marketability, demand and price) should be maintained (Danube GeoTour, 2017). That is the reason why, according to Danube GeoTour (2017), geoproducts have to respond to a need and they need to be marketable and sold. They have to be adapted to market demands and continuously answer to consumers' needs, focusing on new trends and requirements.

Although some authors distinguish the terms geoproduct and geotourist product (e.g. Dryglas & Miskiewicz, 2014; Rogowski, 2016), they are often used as synonyms (e.g. Frey et al. 2006; Neto de Carvalho et al. 2011; Doucek, & Zelinka 2018). According to Dryglas & Miskiewicz (2014), a geotourist product is a composition of a geoproduct and the concept of tourism; it meets the demands and needs of tourists, includes geoproducts such as places, trails, services, museums and centers, as well as elements like guidebooks or maps. Geotourism is an emerging tourism segment, a distinct subsector of natural area tourism, that besides being focused on geology and landscape, it involves all of the wider aspects of tourism activity, transport, access, accommodation and services (Neto de Carvalho et al. 2011; Dowling 2011), based on sustainable and responsible approaches. The focus of geotourism on geology must be supported by interpretive facilities and services that can provide the understanding of geological sites (Hose 1998). According some authors, geoproducts can also be considered geological attractions that can involve products of human activities, creating high value to geotourism, such as built heritage (Compl'ova 2010). Geotourism products are tools to develop tourist market in a high-geodiversity territory (e.g., Kuzmishinov et al 2013). In UNESCO Global Geoparks geotourism products are composed by travel services, transportation/accesses, accommodation, food and beverage, souvenirs/merchandise and the product packaging (e.g., Arjana et al. 2018).

In conclusion, the revision of the scarce literature devoted to the development of the geoproduct concept reveals that: (1) Geosites, museums, trails or guidebooks, together with the aspects of general tourism activity are part of a geotourist product (e.g., Dryglas & Miskiewicz 2014; Rogowski 2016; Chi et al. 2018); (2) geoproducts can include geotourist products (trails or accommodation) and other categories of products (food or handicrafts, e.g., Rodrigues et al. 2017a; Yuliawati et al. 2019b). Geoproducts are not just 'products from a geopark'. Geoproduct is not a simple geographical designation; they are defined mainly through the connection with the singular geodiversity of the place where they come from. Geoparks also promote local products, like artisanal family recipe of Pinguça Liquors from Arouca UNESCO Global Geopark in Portugal (Dias & Magalhães 2017), or the adufe traditional music instrument, watermelons or wild boar pâté from Naturtejo UNESCO Global Geopark also in Portugal, which are not considered geoproducts. As many other new keywords in geosciences, such as geodiversity, geoconservation, geoheritage geotourism now in common use (Thomas 2016), 'geoproduct' has been increasingly within the frame of

tourism industry and the UNESCO Global Geoparks initiative and thus requires a formal definition. According to Farsani et al. (2012a), geoproducts should be commercial and pedagogical tools, made locally, that can be a symbol of the geological heritage of the territory, integrating local and traditional products with geosciences interpretations.

Considering the type of products and services designated as Geoproducts we propose to organize them into 4 main categories: (a) handicraft & merchandising; (b) food, cosmetics and others: geological products, land products, handmade food products and small processing units, cosmetics and others; (c) tourism facilities: restaurants and similars, accommodation, selling points; and (d) tourism related services: tourism companies and other tourism services. 'Geological products' are, for example, the Sierras Subbéticas Salt (Spain), the Langkawi mineral water (Malaysia) or the traditional clay pottery of Mixteca Alta (Mexico) the Azores "Geo-cook", cooked in the hot soil of the fumarole field at Furnas. 'Land products' are agricultural and livestock products, such as olives or meat that reflect the biophysical conditions of the territory and 'handmade food products and small processing units' such as bread, pastry, liquors, wine or olive oil, that give evidence also to traditional techniques of preparation. Cosmetic products include also perfumes, hygiene products and others produced with natural resources such as native plants, clays or olive oil.

Tourism facilities include restaurants, like "Trilobite" in Arouca Geopark (Portugal), accommodation, like Geopark Hotel in Langkawi (Malaysia) or Geo Houses in Jeju Geopark (South Korea), and selling points like "Geopark's friends" local shops in Adamello Brenta Geopark (Italy). For example, the Ju-á hotel, partner of Araripe Geopark (Brazil), has a small exhibition centre about the territory and the geological history (Melo et al 2018). The hotel also has "Doblossauro", a vehicle with a large Pterodactyl, one of the Geopark's icons, at the top, to make tours with guests (Melo et al 2018). The category "tourism related services" includes outdoor companies and others like geotourism products, including Food Trails in Burren and Cliffs of Moher (Republic of Ireland) or GEOfood menus, in Terras de Cavaleiros (Portugal).

## 2.2 GEOfood brand

The GEOfood concept started as a cooperation project between Nordic Countries, in 2014, with Magma (that coordinates the brand; Norway), Odsherred (Denmark), Rokua (Finland), Reykjanes (Iceland) and Stonehammer (Canada) UNESCO Global Geoparks. The first and main purpose was to create a GEOfood label for Geoparks, based on food quality, developing common philosophy, tools and procedures (Gentilini & Thjømøe 2015, 2016). The brand connects the food and raw materials with their area of provenance, highlighting the connection with the Geopark's unique geodiversity (Thjømøe & Gentilini 2014; Gentilini & Thjømøe 2015, Gentilini et al. 2020). GEOfood brand includes products such as jams, sausages or salmon (Magma Geopark), bread (Rokua Geopark), olive oil and honey (Villuercas Ibores Jara Geopark in Spain, Fig.1 a), mineral water (Langkawi Geopark), cakes, dishes and menus, but also restaurants and bakeries (Naturtejo and Terras de Cavaleiros Geoparks).

The certification of partners as GEOfood emphasizes that the raw material origin and the processing should come preferently from inside the Geopark (Gentilini & Thjømøe 2016). The brand is a promotion tool that combines local food and tourism to promote Geoparks heritage. Therefore, Vale et al. (2014, 2019) considered GEOfood products as

'gastronomic souvenirs', as they are products related with geological elements of tourism destinations.

Presently GEOfood members are Magma (Thjømmøe & Gentilini 2014), Rokua (Krökki 2016), Reykjanes, Naturtejo, Terras de Cavaleiros (Morais & Gentilini 2019), Arouca (Duarte 2020), Villuercas, Vis Archipelago (Croatia), Sesia Val Grande (Italy), Tuscan Mining Park (Italy) and Langkawi UNESCO Global Geoparks (GEOfood 2020a). Even though the brand is exclusive for UNESCO Global Geoparks and producers within these territories (Gentilini & Tjømmøe, 2016), geopark projects as Fernando Noronha Island in Brazil have been working to implement the concept (Vale et al., 2014). In Rokua Geopark, a working group formed by local companies is developing strategies for tourism promotion and business development, under the umbrella of GEOfood (Krokkki 2016, 2017). 'Arouca Agrícola & Geofood' is an agricultural project for the territory of Arouca UNESCO Global Geopark where local food is recognized as a factor promoting health and well-being, inducing changes in behaviours and lifestyles (Pinto, 2017; Duarte, 2020). On one hand it provides support in the production and sale of products and at the other it promotes consumer awareness and education (Pinto 2017). Arouca Geofood includes 62 members, since the production to retail, including the creation of menus served in restaurants, school canteens and food tourist itineraries (Duarte 2020). Terras de Cavaleiros UNESCO Global Geopark uses the brand as a gatherer for its gastronomic offer, with 39 restaurants, 10 producers, several gastronomic events, including also a project with students to create new products (Morais & Gentilini 2019).

The GEOfood concept has been enhanced, giving more attention to the food system, along the whole production chain (Morais & Gentilini 2019), with a new Manifesto, more focused in local food as a source for sustainable development. The Manifesto meets the current challenges of the food industry, where UNESCO Global Geopark plays an important role for Sustainable Food and Agriculture, increasing the actions towards the achievement of the United Nations Sustainable Development Goals (GEOfood 2020b). Partner companies are required to foster km zero food and to meet environmental standards, considering water management and waste recycling system, preference use of growing seasonal products and full respect for workers' rights along all the production phases (GEOfood 2020b).

In conclusion, the GEOfood Network provides an opportunity to promote regional development, local resources and products for the smart, inclusive and sustainable growth.



Figure 1 – Examples of geoproducts from UNESCO Global Geoparks: a) OleoExt, GEOfood olive oil from Villuercas Ibores Jara Geopark; b) Jam with “Qualità parco” brand in Adamello Brenta Geopark; c) ‘Geruš’ Miner’s liquor, from Idrija Geopark; d) Sobrarbe Fossils cookies, from Sobrarbe-Pirinecs Geopark; e) Amonite cookies, from Bakony–Balaton Geopark; f) “Geoparkens koftekt”, a chocolate’s box from Gea Norvegica Geopark; g) Morro cheese, from Azores Geopark.

### 3. UNESCO Global Geoparks, local development and geoproducts

UNESCO Global Geoparks are single, unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education and sustainable development (UNESCO 2015). They are territories that combine the protection and promotion of the geological heritage with sustainable local development (Fitzak & Eder 1998; Zouros, 2004; McKeever & Zouros 2005). Geoparks work with local companies to promote and support the creation of new products linked to the geological heritage (geoproducts) (Zouros & Martini 2003; Zouros 2004). It is essential to establish and define quality standards for geoparks services and products (McKeever & Zouros 2005). For this reason, Geoparks must work in tourism certification (Eckardt 2007) and product certification as basic tools for destination management (Marques 2007).

Several Geoparks have their quality labels such as “Geopark Product” in Odsherred, Denmark (Olsen 2014), “Sabores del Geoparque” in Grutas del Palacio (Uruguay), “Geogourmet” in San'in Kaigan, Japan (San'in Kaigan Geopark 2019), “Qualità parco” in Adamello Brenta (Ilaria 2011; Fig 1 b), “Productos de Sobrarbe” in Sobrarbe (Spain), “Naturally Tasty” in Beigua, Italy (Burlando 2017), ‘GeoLine’ in Styrian Eisenwurzen (Austria), or “Naturtejo Geopark Geoproduct” in Naturtejo (Neto de Carvalho & Rodrigues 2009). Considering the importance of the Geopark brand and its economic impact, Jeju UNESCO Global Geopark promoted a Geo Branding project to revitalize the Geopark, reinforcing a representative label that collectively refers to natural, ecological and human resources with the motive of the geological features of Jeju geosites (Jeon 2008). In China, several UNESCO Global Geoparks have been using the Geopark logo to recognize products derived from local partners and supporting local

production and distribution (e.g., Tianzhushan, Taining). Burren & Cliffs of Moher UNESCO Global Geopark developed the Burren Ecotourism Network for planning sustainable tourism. Recognizing the Geopark as a destination is a reference for quality, pride, and genuine commitment to the ethos of sustainability, it was adopted the “Greenbox”, an Irish innovative ecotourism brand, instead of creating another label for the region (Gleeson et al. 2012).

‘Geo-brands’ and ‘Geo-logos’ stand out the quality of the product in the market (Ajayebi & Farsani 2016). The Geopark logo contributes to create a common image of quality, linking the enhancement of earth heritage with sustainable development (Zouros & Mckeever 2009). At the same time, taking advantage of national or international certification brands or Eco-labels for Geopark products, services and activities, help customers to recognize and choose the products with a lower negative impact on the environment (Ajayebi & Farsani 2016). Geoparks play a leading role in the development of place branding strategies, where geoheritage promotes the attractiveness of their territories (Van Geert 2019). At the same time Geoparks need to assure their quality brand is properly used, respecting the UNESCO Global Geoparks principles and guidelines; for that Geopark must establish formal commitments with their partners (e.g., Naturtejo, 2020; Reykjanes, 2020, among many others).

The European Geoparks Network (EGN) started in 2000 with four geoparks in four countries, and now celebrating 20 years of activity, has 81 geoparks in 26 countries. The intense networking actively engaging in common projects has promoted tools and strategies to build successful Geoparks (Pagès & Fassoulas 2020). A EGN working group led by Sierras Subbéticas UNESCO Global Geopark developed guidelines for geoproducts and Geopark branding in European Geoparks.

### **3.1 Economic development**

Geological heritage has become a socio-economic resource that can and must be valued through sustainable tourism initiatives (Rodrigues & Neto de Carvalho 2009). UNESCO Global Geoparks have the potential to generate employment and new economic activities, providing supplementary income for the local population and attracting public initiatives and private capital to create innovative local enterprises and small business (Eder & Patzak 2004; UNESCO 1999, 2010). New job opportunities can emerge from geotourism and Geopark activities like creating restaurants, guest houses and rural accommodation; promoting educational and tourism packages, organizing workshops, regional thematic fairs and festivals, and engaging local communities for geoconservation initiatives in geosites and museums (Farsani et al. 2012a). Linking geopark programs to companies through the creation of products bring economic impacts on enterprises, and promote management models for sustainability (Eckardt 2007). Geoparks encourage local companies to invest and contribute to the development of the local economy, pointing the role of companies engaging several sectors, such as restaurants, lodging or outdoor activities, inspired by local geodiversity (Newsome & Dowling 2010).

The establishment of links with the tourism industry is desirable to foster the use of the geological heritage on business, so Haute-Provence UNESCO Global Geopark in France encouraged artists and craftsmen to seek inspiration in the geological heritage, like the iconic ammonites that symbolize the Geopark, and are the motto for bread, chocolates or pottery (Pagès 2009).



### 3.2 Local communities

Geological heritage management in UNESCO Global Geoparks must encourage the active participation of local communities as these bottom-up strategies are aimed to have direct impact on the territory, influencing its inhabitants' living conditions and environment (McKeever et al. 2010). Stoffelen (2020) reminds that geoheritage cannot be decoupled from people's activities and interpretations and that increased attention to communities is needed to assess sustainable regional development in geoparks. Geoparks need a strong commitment of the local community through local administration, local NGOs and local companies. As example, Naturtejo Geopark encourages new opportunities for local business integrating geoheritage, that was always present in the region, but the Geopark's approach brought a new meaning and role, for the benefit of people (Rodrigues & Neto de Carvalho 2009). Lesvos Island UNESCO Global Geopark in Greece collaborates closely with women's agrotourism cooperatives and local organic food producers providing local products such as pasta, organic olive oil, wine, ouzo, liquors, traditional sweets, and marmalades (Zouros 2010). These products are sold in the Geopark Museum and actively promoted in an agrotourist festival. The production of Geoproducts in Qeshm UNESCO Global Geopark in Iran has created new employment opportunities for the local community and generated income, at the same time that they transfer knowledge and raise awareness for the geopark (Sayedyounesi et al. 2019). Aspiring Geoparks seek, since the beginning of their projects, to develop geoproducts, engaging local communities. In Belitong aspiring Geopark (Indonesia), an empowerment program for women in coastal communities promoted the development of skills in the use of forest resources (Zulfiandi & Eroswati 2018). Fostering creative entrepreneurship, the program resulted in mangrove hand painted fabrics and processed food, promoting nature conservation and improving creative economy. Belitong also proposed a strategy for developing quality geoproducts that can lead to a regional competitive advantage and provide income. SME's in local communities were engaged to develop the whole value chain (Yuliawati et al. 2019a). As Indonesia is one of the major coffee producers in the world, coffee plays an essential role in the community's livelihood, however the territory faced branding and marketing difficulties. Under the aspiring geopark umbrella, it was created a synergy between tourism and coffee plantations' stakeholders so that improved the production and marketing process (Yuliawati et al, 2019b). In the territory of the Geoland of the Holy Cross Mountains Aspiring Geopark (Poland) crafts like clay pottery and wood sculpture are being certified as well as regional dishes such as the famous soup 'zalewajka' (Wesolowski & Poros 2017)

### 3.3 Geoproduct's development strategies

Everywhere, geoparks have created strategies and initiatives to encourage the creation of geoproducts, some by creating their own brands and certification procedures, others organizing events to bring up the theme. Some of the initiatives in European UNESCO Global Geoparks have resulted from EU Programmes for regional development. They have been promoted under the European Geoparks Week, a common event that celebrates the territories and strengthens, towards local communities, the sustainable use of geological heritage that can bring the economic benefit for local people. In Haute-Provence, since early 'geological by-products' were

used to generate complementary revenue and a boost to the local economy, at the same time that chocolate manufacturers agreed to hand over 8% of the global turnover on sales of this product for the management and upkeep of the natural area (Martini 2000).

Regarding the strategies to create geoproductions, Causses du Quercy UNESCO Global Geopark in France proposed to its bakers and chocolate makers the development of a new line of chocolates and pastries: The Causses du Quercy's "GéoDélices". To mobilize participants, still not engaged with geopark, the project started with a contest and included the stimulation of creativity on the geopark heritage until commercial phase (Kühnel & Marlas 2019).

In Qeshm Geopark the design and production of new geoproductions based on natural, cultural and geological elements was promoted besides the optimization of existing products, including quality improvement, package reformatting, adding the interpretative contents, etc. (Sayedyounesi & Amrikazemi 2015). There were training courses and workshops for local producers, tour operators and local tour guides, Geopark partners, crafts shops, and also hotels and restaurants (Sayedyounesi & Amrikazemi 2016). As a result, Qeshm Geopark developed a "Geoproduction Quality Standard" with an evaluation system for monitoring and optimize the geoproductions. Sitia UNESCO Global Geopark in Greece implemented a "Local Quality Pact", a trademark to support the products and services developed by local stakeholders and community (Perakis 2020). The certification requires companies premises like a clear connection with the Geopark, promotion of local history and traditions or the use of local products; branded companies benefit from promotion and preferences in receiving visitors.

Many of the geoproductions developed by Geoparks result from contests organized to promote new ideas. Jeju Island Geopark organized in 2014 a "Geofood Recipe Idea Exhibit" that resulted in about 400 recipes. Some of them were selected through a contest, such as columnar joint chocolate, cross-bedding cookie or Sponge cake (inspired by Suweolbong volcanic deposits). The recipes were improved and standardized and they were made available to local food business (GGN 2014). In another Asia-Pacific Geopark it was promoted the "Hong Kong Global Geopark of China Gourmet Competition", in 2016, to foster the creation of innovative dishes, drinks and desserts. Restaurants and cafes designed menus, including "Seaside Hexagon" drink, the "Classic Rock Cascade" appetizer, "Caution! The Bubbling Lava!" soup or "Placoderm the Crispee" cookie (Hong Kong 2016, 2018). The Geolicious Menu Factsheet frames each dish name with a description and the connection with the Geopark features. Under the umbrella of GeoExperiences, Hong Kong UNESCO Global Geopark has partnerships with hotels that display information, manage Geopark tours, have dedicated Geopark in-room tv channel and they offer geopark-themed dishes (Hong Kong 2018). This was a very important approach to strengthen Geopark image even if it still has a low magnitude of reflection in the destination image (Chan & Zhang 2018). Arouca Geopark organized "GeoArte", an handcraft competition, first in 2010 and once again in 2020, inspired by the Geopark's heritage, fostering privileging quality, genuineness, creativity in innovation and inspiration in heritage (Arouca 2020). According to Arouca UGGp, it is considered 'traditional handcraft' when it uses traditional processes, techniques or raw materials, able of being identified as traditional or typical of the territory or with cultural roots. It is considered

'contemporary handcraft' when new techniques, new raw materials and new technologies are used, expressing the current fashion and market trends (Arouca 2020).

Geoproducts and other local products are promoted by Geoparks at food fairs and festivals, like in Terras de Cavaleiros Geopark, where it was organized the first "Gastronomy Festival" in 2015 (Marcos & Carvalho, 2017). The geomenus included geodishes, such as a metamorphic steak, Variscan seafood or "Seams with gold from the earth". Azores UNESCO Global Geopark promoted the GEOFood Festival in 2019, where restaurants presented innovative GeoMenus, inspired by the Geopark's landscapes. The festival was a stimulus for restaurants to diversify their offer and to promote a new gastronomic dynamic that captivates the public to new concepts, integrating food and territory and valuing the regional products (Azores 2019). Sierra Norte Sevilla Geopark has organized annually the Geological Gastronomy Days with the main purpose of bringing geology to visitors through gastronomic tastings. Menus are conceived with "Geotapas", such as a fossil trunk dish, marbled cheese pie, and granite cakes. During the degustation geological topics related to each plate were explained. Also in Spain and Portugal, the Courel Mountains and Naturtejo UNESCO Global Geoparks organize and promote exhibitions and festivals dedicated to local products (wine, chestnuts, olive oil, honey; Courel Mountains Geopark 2020). To develop the Burren Food Trail, Burren & Cliffs of Moher Geopark promoted "The Burren Weekly Food Series", a range of food and cultural events that promoted participation of business and non-food businesses for co-operating to create visitor packages (O'Dwyer, 2013).

Regarding retail, there are geoparks that only promote products while others actively sell them. Adamello Brenta has a network of local shops, "Geopark's friends", with a Geopark's corner where is a showcase of Geopark's products (Mase & Rigatti 2017). Other Geoparks sell directly Geopark products in their visitor's centres, as Orígens UNESCO Global Geopark in Spain. (Van Geert, 2019). Also in Spain, the Basque Coast UNESCO Global Geopark sells in tourism offices the 'GeoGourmet' product basket, a selection of the most typical products produced from farms and fishermen with a Guide for tasting (Barriuso & Hilario 2014).

Strategies to develop new geoproducts include also educational projects, where geoparks work together with schools, integrating local heritage and also fostering a business model, with the commercialization of products. Under the scope of GEOfood brand, Terras de Cavaleiros Geopark run a pilot educational project "Stones at the Table", together with students and companies to create new products (Marcos & Carvalho, 2017). The project resulted in two new sweets "Garnets" and "Umbiguitos" (belly buttons) that can be bought in pastry shops (Morais & Gentilini 2019). In Naturtejo Geopark, students of the professional course of Cooking and Pastry, in Penamacor, created "rolled pebble cookie"s, river pebble-shaped cookies covered in pebble-colored chocolate. In the early design phase students made field trips to better know Geopark's geodiversity and the cookies were later tested in several local and international public events. The public is invited to taste a pebble cookie, inside a container along with real river pebbles. The challenge is to distinguish them. On the other hand, also new businesses were created in Naturtejo's resulting from master degree's projects, at the School of Management of the Polytechnic Institute of Castelo

Branco, such as Amo Produto Local (Jóia 2011) and Aromas do Valado concept and project (Vinagre 2015), as also its visual identity and branding (Correia 2019). Geoproducts and other geotourism products are part of the tourism offer of a Geopark and so must be included in promotional materials, as leaflets, maps or Web GIS apps (e.g., Staridas & Fassoulas 2015).

### 3.4. UNESCO Global Geoparks geoproducts

The Global Geoparks Network already has a story of over two decades supporting the development of geological-inspired commercial products. Many cases of success are still flourishing business. Sierras Subbéticas have been developing geoproducts for a long time, having chaired an EGN working group for the topic. Besides creating geologically related merchandizing, such as souvenirs or handicrafts in ammonite shape (Arroyo & Barquero 2013), they promoted the “Salt from Tethys Sea”, a real geological product. The salt presents the geological history of the Geopark, related with the large amounts of salt deposited in warm and shallow waters more than 200 Ma ago, in the Tethys Sea (Arroyo & Barquero 2011). The geopark certifies that it is a natural product with no additives, harvested by hand in an environmentally sustainable exploitation. The Flavours from the Tethys Sea also inspired a menu with local products and geological shapes combined, resulting in original and tasty dishes like Cheese crinoids, Dinosaur bites or Belemnites stuffed with seafood (Barquero et al. 2016).

A very common approach in creating products is to give it a name directly related with geodiversity elements, such the “Classic Rock Cascade” appetizer, from Hong Kong Geopark, the metamorphic steak from Terras de Cavaleiros or the “Fen Volcano Soup” from Gea Norvegica UNESCO Global Geopark in Norway. Another approach is to seek inspiration in geoheritage to shape products like bread and chocolates, like in Haute-Provence, the Garnets in Terras de Cavaleiros, Sobrarbe Fossils (Fig 1 d), Bakony-Balaton Ammonite cookies (Fig 1 e), the Ripple Marks in Langkawi, the Trilobite or Daedalus cookies in Naturtejo or cross-bedding in Jeju.

In Catalonia Central Geopark several restaurants created deserts inspired by geology, using typical ingredients to represent shapes and textures of geodiversity. One example is the handmade biscuits “Les Falletes”, inspired by an iconic geological fault (Rubio 2016, Coit 2016). Also Messel Pit World Heritage Site, in Bergstrasse-Odenwald UNESCO Global Geopark in Germany, offers enjoyable earth products such as the “Rain forest cake”, “Maar crater soup” or fossil shape cookies in order to foster the geotourist component of the destination (Frey 2014). In Azores, products that incorporate the volcanic footprint are considered geoproducts, as the traditional “Geocook” (*Cozido das Furnas*), a stew of meat and veges cooked slowly underground in the thermal soil of a fumarolic field, that gives it a unique sulphur-rich volcanic taste (Nunes et al. 2011). GeoCommunity is the Geopark Community Program from Langkawi. It is based in a network of members (people and organisations), that share the same vision of raising the profile of the Geopark. Among 22 ambassadors there are geocookies, inspired by Langkawi's fossils and geological wonders, such as dropstone cookies, trilobite tarts, ripple marks, granite cookies, and also handmade soaps, virgin coconut oil, and craftwork specially made of coconut shells or coffee (Langkawi 2018). Most of the UGGps have merchandizing and several promote handmade geoproduct merchandizing, like the candles with geological motifs of Vulkaneifel UNESCO Global

Geopark in Germany (Frey, 2006), or tiny mammoth magnets in Rokua. In order to promote the conservation of the paleontological heritage, a great challenge for some Geoparks, they boost the sale of fossil replicas, like in Haute Provence or Araripe UNESCO Global Geoparks. Geodiversity in UNESCO Global Geoparks have been a source of inspiration for the development of new Geoproduct businesses, from replicas to merchandizing, restoring or giving a new breath to traditional handcrafting, inspiring artists, chefs and crafters, and creating income and fostering entrepreneurship, contributing decisively for local GDP and thus strengthening local identity.

### 3.4.1. The Danube GeoTour Project

In the frame of the Danube GeoTour Interreg project co-funded by the European Union a practical guideline was established for defining and creating geoproducts (Danube GeoTour 2020). According to Danube GeoTour (2017), geoproducts must have direct connection with the Geopark's territory, being produced by a geopark's partner and encouraging the local community. Besides the essential connection to Earth it is necessary to understand geoproducts as a tool for socioeconomic development. Geoproducts have to be adapted to market demands to assure the economic viability, "it can only exist if it is bought". Under the project, a Guideline was created for the development of innovative geoproducts (Danube GeoTour 2017), according to which geoproduct has to follow three basic requirements: geological connexion, economic viability and geopark partnership. It is essential to identify key actors to be engaged and main steps to obtain a product at the intersection of the two axis – management and identity. This project used a matrix in order to identify connections between local communities (and producers), local geodiversity and geoheritage management (geopark strategy) and geoproduct development and marketing (Fig. 2).

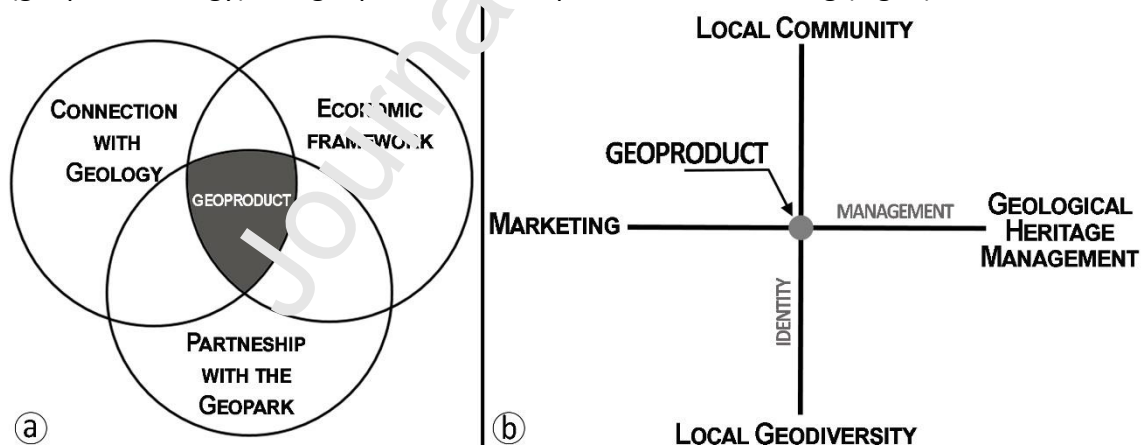


Figure 2 - Geoproduct requirements (a) and philosophy (b), according to Danube GeoTour 2017

Danube GeoTour (2017) suggested four groups of geoproducts: market objects (souvenirs or food), outdoor activities, indoor activities (such as programmes in museums, info centres, restaurants or tourist farms) and small interpretation infrastructures dedicated to specific local heritage items.

Under the Danube GeoTour project, Bakony-Balaton Geopark developed food products that deliver clear and simple messages and stories, like Volcanic Bombs, the Badacsony Rózsako Wine and an infusion of herbs "By the Volcano's feet", supporting

local farmers that gained experience in improving innovative marketing and selling strategies.

Due to Idrija Geopark's strong handicraft tradition, GeoArt products were developed and labelled "Creativity and heritage hand in hand", like a wooden board for degustation related with mining traditions, or 'Šajblck', a small clay pot, formerly used with fat or wax as candle on the graves. It was also developed the food label "Tastes of Idrija Geopark", for products like the 'Geruš' Miner's liquor (Fig 1 c) , the Knapove sanje dish (meaning 'Miners dream') or the Rezi Cake, a dessert that combines traditional lace and mining heritage. Besides food products, it also includes a gastronomic tourist program, "Roaming in the Hills" and a culinary event (Erjavec 2018). Hateg Country Geopark developed a network of visitation and interpretation points, the 'Geopark's Houses', together with DinoStops (artistic reconstruction of Hateg's exclusive dinosaur species), linked by thematic trails and connected to local community initiatives (Andrasanu & Ciobaru 2018; Popa et al. 2018). Other geotourism products were developed in these geoparks such as GeoRafting, in Styrian Eisenwurzen, GeoBiking, in Karawanken-Karavanke trans-border geopark (Austria-Slovenia), GeoChallenge, a tourist programme, in Dapuk (Croatia), GeoHiking in Djerdap and GeoFamily, an interpretation strategy for geosites (Serbia), in Iron Mountains Aspiring Geopark (Czech Republic).

At a result of pilot geoproducts development under the Danube GeoTour it was recommended: to continuously adjust and improve the assessment mechanism; to test and get feedback of the products (including evaluation of visitor satisfaction and impact on the local community); to have strong regional partners and to encourage local producers for better with more meetings; to integrate geoproduct concept with the Geopark's strategies, incorporating geoproducts in all promotion tools; to seek innovation through cooperation with experts from other Geoparks; and to manage a permanent cooperation between Geopark management team, external experts and partners (Danube GeoTour 2017).

This project showed that the motivation and engagement of local stakeholders have a key role in the Geopark success.

### **3.5 Geoparks, geoproducts and the United Nations Agenda 2030**

UNESCO Global Geoparks are part of United Nations Agenda 2030, being deeply committed to the Sustainable Development Goals (UNESCO 2016; McKeever 2018). These 17 life-changing Global Goals, and the specific targets for each goal, are aimed to achieve a better and more sustainable future for all by 2030. Geoproducts contribute to create jobs in food production, handicrafts and tourism services, providing income (SDG 1) and together with Geoparks tourism strategies and green economy they foster economic growth (SDG 8). Economic prosper of regions and good nutrition bring good health (SGD 3). Food and agriculture in UNESCO Global Geoparks foster agricultural productivity and incomes of small-scale local producers, contributing to ensure sustainable food production systems and to implement resilient agricultural practices, preserving ecosystems (SGD 2). With Geopark certifications and guidelines, best practices can be recommended for agriculture production (SDG 2), sustainable production patterns can be privileged (SDG 12) and climate change effects mitigation (SDG 13). Tourism businesses and food systems must overcome the dependence on fossil fuels and promote the shift towards increased renewable energy (SGD 7).

Geoproducts initiatives can promote production and supply chains that reduce waste generation and food losses (SDG 12). Sustainable agriculture practises, advocated in the UNESCO Global Geoparks have the potential to address water scarcity, protect and restore water-related ecosystems (SDG 6). Geoproducts create awareness on sustainable development and lifestyles (SDG 4, 12) and they can be itself educational tools for both formal and non-formal contexts (SDG 4). On another hand, the raise of innovative business and companies demands more and more skilled people (SDG 4), boosting gender equality and empowerment of women, through the provision of direct jobs or through the development of women's cooperatives (SDG 5). Geoparks can attract academic research and scientific projects, and can foster innovation to open new markets (SDG 9). At the base of the concepts of geoparks, geotourism and geoproduct are the protection and safeguard the world's cultural and natural heritage (SDG 11), as well as geoparks in coastal areas rely on sustainable and healthy marine ecosystems (SDG 14). Geoproducts are rooted on natural heritage assets whose conservation is essential for the maintenance of the product and of the whole Geopark's tourism strategies (SDG 15). The development of geoproducts connected to Geoparks is a community-based strategy, where local stakeholders play the most important role (SDG 16), establishing regional cooperation networks (SDG 17). Also internationally, through GGN partnerships and Geoparks regional networks, sustainable development is sought in several levels, sharing best practices and knowledge (SDG 17). This wide network of associated Geoparks contribute to reduce inequality within and among countries (SDG 10).

### 3.5.1. Sustainable Food and Agriculture

In rural areas, where most of the UNESCO Global Geoparks are located, agriculture is a very important activity, reflected in the culture and historical landscape, with economic impacts. In addition, geodiversity and derived landscapes influence agriculture activities of geoparks, providing opportunities to marketing Agriculture in geoparks (Thomson 2007). Last Ice Age made farmlands in Odsherred Geopark are rich in minerals that became renowned for the high-quality vegetables that supply gourmet cuisine (Olsen 2014). This Geopark organized a cluster of farm shops and local producers and developed a model for distribution of local products, under an attractive "Geopark product" label (Olsen, 2014).

Soil is a very important part of geodiversity (Gray 2004), resulting from rock weathering and erosion at the Earth's surface. As part of geodiversity soils have a direct influence in agriculture, forest production and animal husbandry and they contribute for the diversity of products. Parent material composition and soil mineralogy influence nutrient and minerals available at the same time as their structure and texture controls water content. Topographical conditions as slope and altitude, as well as latitude, influence solar warmth, daylight timing, precipitation and the growing conditions. Wines reflect this diversity and therefore they are promoted by Geoparks, like for example in Naturtejo, Azores, Luberon, Orígens, Bergstraße-Odenwald, or like the Vulkaneifel grapa. Geowines from Azores Geopark (Terras de Lava, Magma, Basalto, Lajido, Pedras Brancas) are influenced by the fertile volcanic soils derived from different types of rock (Nunes et al. 2011). More and more geoparks are developing projects that explore the relationship between viticulture and geology, such as Luberon (Leonard et al. 2016), Beaujolais (Cazé C 2017, Bettant du Breuil

2019), Apuan Alps (Ottria et al 2015) or Orígens (Puras 2015) where winemakers included the geological history of the territory on the tags of their bottles (Van Geert 2019). Beside wines, other agriproducts reflect geoparks geological settings, as in Unzen Volcanic Area UNESCO Global Geopark in Japan, where volcanic activity influenced soil by ashes deposition from lahars. Unique potatoes are produced in reddish-brown soils, surrounded by lava stone walls that shape the landscape (Ohno 2004). The Volcanic Sake is also a local geoproduct.

These local geological influences on farming, when properly presented to consumers, provide an added attractiveness to the products through a high quality Geopark agriculture marketing strategy (Thomson, 2007). Information about soil and landscape is used in an Apuan UNESCO Global Geopark farm in Italy to promote traditional agriculture, food products, wine and new sustainable agricultural techniques (Amorfini et al., 2014). Also Jeju Geopark thrives a Geo Farm, where products are cultivated and sold (Jeon 2008). "Geogourmet" products from San'in Kaigan Geopark are favoured by the singular geological and biophysical conditions, like San'in Dunes Shallots, Nikko Ginger or Tottori Wagyu Beef (San'in Kaigan Geopark 2019).

Agriculture is the main world food source and it is an activity with a great environmental footprint. Current challenges regarding climate change, water management, biodiversity loss, scarcity of food and growing population demand from Geoparks an active role. Innovative solutions are being sought in Vulkaneifel Geopark to enhance biodiversity and to mitigate soil erosion in maize fields used for biogas. The cultivation of an alternative crop such as the "cup plant" (*Silphium perfoliatum*) is being tested to stabilize the soil, consume less water and attract insects (Benzing et al. 2020).

In Cilento, Vallo di Diano e Alburni Geopark, a local variety of artichoke, existing only in the area of the geosite Angelo a Perosa's Cave, has been saved from extinction and successfully introduced in a productive cycle (Amato et al 2012a). The Integrated Environment Museum, dedicated to the vegetation and agriculture of the Geopark, presents these traditional practices and local genotypes and also its connection with the biophysical and geological conditions of the geosites. The museum also presents *Ampelodesmos mauritanicus*, a remarkable plant for erosion control and its ethno-botanical importance used for handicrafts (Amato et al 2012b). The Cilento, Vallo di Diano e Alburni Geopark has the recognition of Bio-district, from the International Network of Eco-Regions. In Naturtejo Geopark, Idanha-a-Nova municipality was also included in the Bio-district network. These are territories naturally devoted to organic food and farming where farmers, citizens and public authorities agree to the sustainable management of local resources, based on the principles of organic farming and agroecology.

Bergstrasse-Odenwald Geopark also encourages regional biological diversity, focused in meadow orchards and their importance as habitat for numerous species, at the same time it preserves local fruit varieties. The programme "Fruit Variety of the Year", committed with the SDG15 (Life on Land), includes plantation campaigns and the development of associated products such as liqueurs, brandies or juices with the fruits (Weber & Mayer 2020). In Styrian Eisenwurzen Geopark there is an important variety of apples and pears, some of them rare and even almost lost varieties, that are being used by the "Veitlbauer" – Cider cellar and experience farm (Gulas 2017). Also due to biodiversity loss concerns, Marble Arch Caves UNESCO Global Geopark in Ireland



promotes regularly a “Bee Keeping Practical Workshop”. Bees are main pollinators essential for the formation of plant fruits and seeds, which will produce new plants, the base of the ecosystems development. In Bergstrasse-Odenwald Geopark there is the organic certified “Geopark Messel honey” produced by a local beemaster in the ‘Bioversum’ (museum of biodiversity) (Weber 2015).

Mt. Lushan in China, Bergstrasse-Odenwald and Naturtejo Geoparks, under the umbrella of the “Peony City” brand, foster the protection of peony, with dedicated events (arts exhibition, festival, market), creation of peony gardens, exchange of experience and plants, as well as research and development of thematic tourist travel packages (Weber et al 2015). Aware of the vulnerability of the wild peony, Naturtejo Geopark has been developing a conservation project in Toulões Peony Village, focused in local development and biodiversity preservation (Neto de Carvalho 2017/18). The purpose is to preserve the rare seeds of *Paeonia broteri*, to maintain its unique genetic heritage, multiply them and reforest fields. Beside the Peony seeds, Naturtejo Geopark and the organic and biodynamic seed company Sementes Vivas/Living Seeds are promoting the recovery of traditional seeds, ‘Heritage seeds’ from the Geopark, such as tomatoes, peppers, watermelons, beans, turnips (Rodrigues & Groenewegen 2018). Through this new project, the understanding and awareness of the local seed heritage, the cultural traditions related to the crops, and their role in climate change mitigation are enhanced. Naturtejo Geopark has been growing in the sector of green economy and organic production. Aromas do Valado has stood out as a distillery of aromatic and medicinal plants that cultivates and processes autochthonous plants of Naturtejo Geopark, producing essential oils, personal care products and cosmetics (Vinagre 2015; see below). Also maturated beef (Geopark Prado) and wine (Herdade do Escrivão) are Geopark’ ambassadors, in these cases produced with sustainable practices in the ecosystems.

Sustainable agriculture is being pursued with Arouca Agrícola, an agricultural project in Arouca Geoparks, where 62 small local farm partners provided more than 50 tons of fruit and vegetables during the last three years. The initiative includes different local stakeholders from local producers, a local market, restaurants and school canteens with a strategy for a short food supply chain (Pinto 2017; Duarte 2020). Styrian Eisenwurzen has the project ‘From the orchard to the filled bottle’, a network with local farmers that promotes orchard farmers and their local products (Gulas 2017).

Burren and Cliffs of Moher Geopark promotes the “Burren Food Trail”, developing a tourism offering based on local gastronomy, which makes the Geopark destination known as synonymous with great food and great food experiences (O’Dwyer 2013). It includes food producers and growers, food establishments and circuits where food takes from field to plate, such as the “Farm to Fork Trail” or the “Market Garden Trail”, balancing local environment with viable tourism (O’Dwyer 2013). Gender equality and woman empowerment are key components of sustainable socio-economic development projects, such as the local food product development, national and internationally awarded (Doyle 2020). In Finland, barley cultivation dates back to 4200 BC and Saimaa Aspiring Geopark region is the birthplace of the traditional Karelian pie, produced since 16th century with barley sauce. This product, very well known all over the country and eaten in every family gathering or every gas station cafeteria, is an example of GEOfood with great historical and cultural value (Heli 2019). This territory had the first regional designation of origin label in Finland and producers develop high-

quality products, with manufacturing methods and short production chains (Partti & Poutamo 2017).

The Ly Son Aspiring Geopark (Vietnam), also outstand its geoproducts with high additional value attractions (Chi et al. 2018). The region is considered “the kingdom of garlic”, with a distinctive strong-smelling and delicious taste. Other food related activities such as planting, caring, and harvesting garlic, picking seaweed, and fishing with local people also offer innovative experiences for visitors.

#### **4. Naturtejo Geopark strategy to implement geoproducts**

##### **4.1 Naturtejo UNESCO Global Geopark, a local sustainable development strategy**

Naturtejo was the first Geopark in Portugal, integrating the European and Global Geopark Networks in 2006 (Neto de Carvalho 2008; Neto de Carvalho & Rodrigues 2010). It is located in the centre of Portugal at the border with Spain and includes a total area of 5067 km<sup>2</sup>, which corresponds to 5,5% of the whole country's territory. Naturtejo EIM is the management body of the Geopark, an intermunicipal major state-owned company, established in 2004, including also private companies as associate partners, with the aim of creating conditions for the economic development relying upon tourism development. The engagement of local community has been essential to the development of tourism quality products leading to increased efficiency and competitiveness of public and private institutions (Marques 2009).

When the Geopark was first conceived and the project started to be developed, the remote and rural region where it is located had no clear tourism strategies. After 16 years, it is recognized that the geological heritage, its international recognition and the Geopark dynamics increased the capacity for tourist and economic attraction of the territory. These positive impacts in the region lead to the territory extension, in 2015, to include one more municipality (Vilas Boas et al., 2016). It is now clear the contribution of the institutional innovation played by Naturtejo Geopark for the development of tourism in a low population density territory, even if there is still a long path to go (Ramos 2016). The Geopark has a significant geodiversity, which demonstrates over 600 million years of Earth History and a strong and ancient interaction between local communities and nature (Neto de Carvalho 2005). Geoconservation is the basis for geotourism strategies in order to ensure the safeguarding of ge heritage, considering the dedicated balance between potential threats caused by broad visitation and the geosites role in raising awareness for geoconservation (Rodrigues & Neto de Carvalho, 2010).

The tourism offer of the Geopark is organized in Tourism Programmes, complete experience packages that always include the geological heritage, together with accommodation, gastronomy, guided visits and activities, that are designed for different publics and markets. Hiking, biking, birdwatching, learning from a former miner, trying the raw materials and old techniques of a craftsman, tasting a rare historic wine, panning for gold, singing or dancing with a local group or just contemplating the landscape are some of the experiences the Geopark provides. Naturtejo Geopark brought an innovative approach to territorial marketing and tourism development, based on the ancient history of planet Earth, ensuring a unique combination of experiences and emotions that differentiates the Geopark from other tourism destinations (Neto de Carvalho 2005; Neto de Carvalho & Rodrigues 2010; Rodrigues & Neto de Carvalho 2010; Neto de Carvalho et al. 2011; Fig. 3).

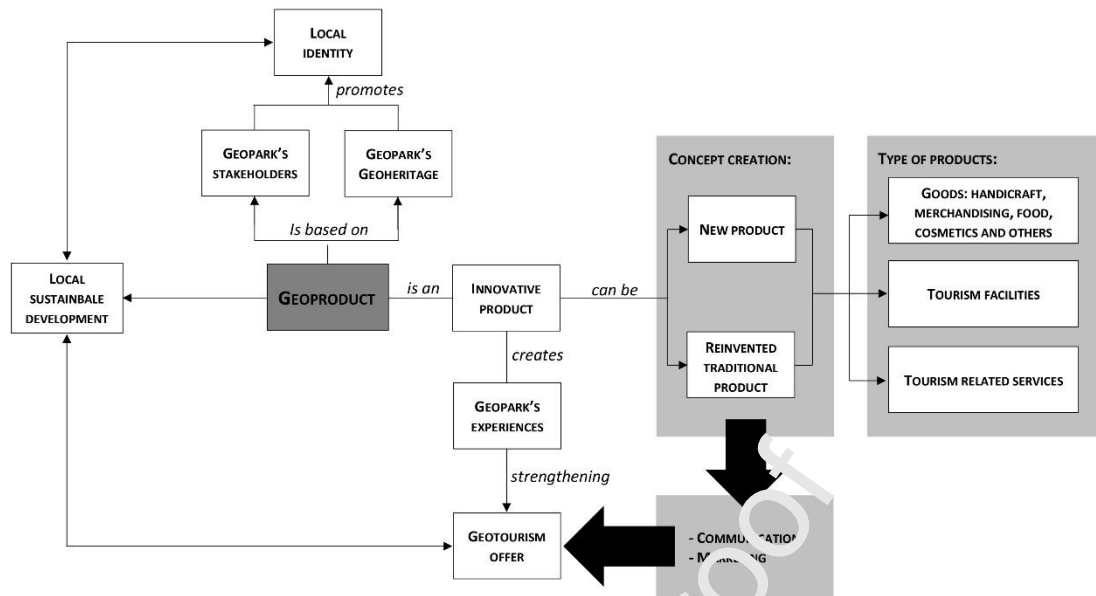


Figure 3 - Conceptual framework of Naturtejo Geopark Geoproducts

#### 4.2 Geoproducts certification

Geoproducts are considered products and services based on geodiversity, especially the geological from Naturtejo UNESCO Global Geopark. These are innovative products, which can be new products or reinvented traditional products. The goals of the Geoproducts label developed in Naturtejo UGGp, are: (1) to certify the origin of the product in a UNESCO territory; (2) to create new and unique (geo)experiences – diversification of the offer; (3) to connect the Geopark landscapes and geodiversity with products; (4) to raise quality standards and strength relationships between producers, entrepreneurs and other stakeholders; (5) to create added value to the product, providing or enriching identity; (6) to foster local economy; (7) to promote national and international partnerships; (8) to foster an integrated and articulated promotion.

The brand recognizes the origin of the product in this UNESCO recognized territory, where geoheritage is the motto, therefore, besides the connection with the local heritage, the certification requires that: (1) the Geoproduct companies must be located in Naturtejo Geopark territory, (2) a significant part of the raw materials come from the Geopark, and (3) the production is made in the Geopark. To become a geoproduct it is necessary to follow common procedures for all the products and specific procedures for each category, as it will be further discussed below.

As an opportunity, geoproducts enjoy the recognition of a territory recognized by UNESCO and other national and international awards. Companies benefit from technical support to develop Geoproducts and training about the Geopark. Geoproducers must be engaged with the Geopark activities, contributing for the Annual Plan and promoting joint activities.

Naturtejo Geopark formally joined the GEOfood brand in 2019, starting with two restaurants (GeoRestaurant Petiscos & Granitos and Helana) and the cake design company Geocakes. The two brands will be managed on an integrated and complementary basis, without overlaps, in order to enhance each product in the best

way, in different strategies, targets and markets, according each brand's approaches and principles, although most of them common.

#### 4.2.1 Good Practice Commitments

The Naturtejo Geopark Geoproduct brand has no fees for the producers; it can be used by associates and partners, and those can be producers, craftsmen, associations of tourist, cultural or recreational activities; tourism companies, accommodations, restaurants, selling points and other tourism related services. Companies must be legally constituted, with the situation regularized before the Tax Administration and Social Security and respect the legal rules that regulate their activity. They also need to be social- and environmentally responsible, ensuring that their activity does not disturb the environmental quality of the territory and not be involved in the sale of geological material. Geoproducers need to accept and adopt the "Good Practice Commitments", committing themselves to the values of Naturtejo Geopark and sharing its UNESCO good practices. Geoproducers are awarded with a certificate and a 'Partner' plaque to display in their facilities, highlighting their quality and respect to natural resources and heritage.

The commitment obliges geoproducts to maintain quality standards and to provide customers quality information about the territory. It is advisable that geoproducers establish partnerships between them to take advantage of the Geopark geographical framework and concept, in order to maximize mutual benefits and contribute for a km0 economy.

For each category there is specific requirements but all of them should use the Naturtejo Geopark Geoproduct logo and give visibility to the Geopark heritage and its connection with the products, not only in the labels and packages but also in spaces decoration or marketing material. Geoproducts are monitored through frequent communication between the partners and Naturtejo Geopark, visits and common activities. One of the strategy's success indicators is the assessment of product distribution in local shops, in gourmet, organic and other niche shop all over the country, in supermarket chains including fair trade organic supermarkets, big online shop platforms, restaurants, local shops and cafés.

Currently there are 22 geoproducts (Table 1) in Naturtejo Geopark, all of them local small and medium enterprises (SMEs):

Categories	Number of Geoproducers
Handicraft & merchandising	2
Food, cosmetics and others	13*
Tourism facilities	4
Tourism related services	3

Table 1 – Distribution of Naturtejo UNESCO Global Geopark Geoproducts by category (\*6 in 13 producers have organic certification).

#### 4.2.2. A communication tool

Geoproducts can be used as strategies for geological topics knowledge transfer and geoeducation as well as to raise awareness for Geodiversity (Rodrigues & Neto de Carvalho 2009, Farsani et al. 2017, Rodrigues et al. 2017b). They can trigger curiosity and engage ‘consumers’, in formal or informal education environments, making geosciences more accessible.

Advertisement displays and labels can bring science contents to the products, through descriptions or design, like for example the Salt from Tethys Sea, in Subbeticas Geopark, with the history of the primitive sea (Arroyo & Barquero 2011). Langkawi mineral water promotes its origin from a granite aquifer, 130 m below surface, made of rocks with about 217 million years. In Naturtejo Geopark, Vale de Aromas olive oil, metaphorically considered the ‘gold’ from Tejo river, recalls the gold mining heritage of the place where it is produced. The cheese ‘Morro’ from Azores Geopark, produced near the geosite Morro do Castelo Branco, a trachytic dome, displays a photo of the geosite on its label (Fig 1 f).

By promoting the effects of geodiversity on local products, producers contribute for creating an idea of superlative quality, inseparable from the image of territory that the Geopark wishes to create (Van Geert 2019). Some Geoproducts have educational potential due to product shapes and design, like Geocakes, a cake design company in Naturtejo Geopark, whose cake of a trilobite producing Cruziana, besides being tasty, can teach trilobite feeding behaviours or paleogeography (Neto de Carvalho & Rodrigues 2017, Rodrigues et al. 2017b). Gea Norvegica Geopark developed the so called “Geoparkens honfekt”, a chocolate’s box where each of them has a geological related source (ex. gneiss, conglomerate or lavvikite, the Norway’s national rock type) and that includes a leaflet where each rock is framed and located in a map (Fig 1 g). Products can be tools for biodiversity conservation, as for Aromas do Valado, essential oils distillery in Naturtejo using native plants, with their own academy project (Vinagre 2015). Styrian Eisenwurzen Geopark producers, committed to making known local herbs to new generations, promote public activities. They prepare recipes of smoothies or herb bread, in order to raise awareness about biodiversity and the responsible use of natural resources (Auer & Kollmann 2016). In Bergstrasse-Odenwald Geopark, the programme ‘Forest and Meadow Kitchen’, combines field trips, mushrooms and wild herbs collecting and cooking in the outdoors laboratory (Weber 2015).

The key message that ‘geodiversity matters’ must be communicated strongly (Gordon et al. 2012) into all level, and geoproducts are the right tools for it. In Naturtejo Geopark geoproducts must demonstrate in their label, packages or facilities, that its singular and differentiating characteristics result from the special context where they are, a territory recognized by the international value of its geological heritage, by using the geoproducts logo (fig.4). Geoproducts tell stories, illustrate landscapes, teach curiosities and bring memories.



Figure 4 – Naturtejo Geopark geoproduct logo includes European and Global Geoparks Networks logos (a) with the exception of products containing alcohol, such as wine or liqueurs (b)

### 4.3. Naturtejo Geopark Geoproducts presentation

Several geoproducts have been conceived, practically since the beginning of the Naturtejo geopark project. Some very experimental and naïve, at the beginning of the implementation of the concept, others were overly ambitious. After an initial stage, in which the Geopark needed to more active in the incubation of geoproducts, nowadays the local companies have been showing interest in joining their products and services to the goals of the Geopark. The role of the geopark increased in assisting the development of the projects. Right from the beginning the company Incentivos Outdoor, based at Portas de Ródão Natural Monument created geotourism services such as GeoKayak, GeoTrekking and GeoTours (Rodrigues & Neto de Carvalho 2009). It was the first private partner providing activities such as panning for gold to visitors. Other outdoor company Trilobite.Aventura introduced a geological approach in their offer, with sport activities, such as the creative TriloPaint, a paintball competition. Their name and logo were inspired by the trilobite fossils most common in Penha Garcia Ichnological Park, the geomonument where the company was located (Rodrigues & Neto de Carvalho 2009). Ô Hotels & Resorts, in Termas de Monfortinho, created “Trilobitinhos” (meaning little trilobites) a menu designed by the Chef Ramos especially for kids, and inspired by Naturtejo fossil record, with some activities to do while adults were calmly enjoying their meals. Under the European Geoparks Week, in 2012, the Geosweet Contest was organized by the Municipality of Oleiros, in order to foster creativity of local people and companies, creating the best recipes to represent the landscapes and heritage with a sweet taste. Naturtejo Geopark Geoproducts are true ambassadors of the Geopark brand, being more than products they spread local identity where markets can lead them.

#### 4.3.1. Handicraft & merchandising

Artisans are reinventing products with ancient artistic know-how approached with new visions, ideas and special interpretations of Naturtejo Geopark. These geoproducts can be typical artisanal products or handmade products that promote the territory identity. The goldsmith Paulo Dias, descendant of a long family tradition, created a handmade line of jewellery “Trilobite... Precious – for million years”, with unique earrings, ring and necklace inspired by an Ordovician calymenid trilobite, the most iconic symbol of the geopark’s geoheritage (Fig. 5 a). VÓNô is a talented artisan, who reinvented “burel”, a Portuguese handmade wool fabric, adapting it to the Geopark’s stories, textures and colors (Fig. 5 b).

#### 4.3.2. Food, cosmetics and others

Most of the Naturtejo Geopark food geoproducts incorporate the Mediterranean Diet, one of the main cultural expressions of the Geopark, inscribed on the Representative List of the UNESCO Intangible Cultural Heritage of Humanity since 2013. It embraces a set of skills, knowledge, rituals, symbols and traditions concerning crops, harvesting, animal husbandry, conservation, processing, cooking, and particularly the sharing and consumption of food (UNESCO 2013). As advocated by the Mediterranean Diet, in the

Naturtejo Geopark region there is a high consumption of olive oil, legumes, unrefined cereals, season fruits and vegetables, and moderate consumption of dairy products, as cheese, or wine. It is a region very prosperous in olive oil production, a product with studied potential health factor for reducing all-cause mortality and the risk of chronic diseases.

In this category geoproducts differentiate themselves through Geopark related names or shapes but the visibility must be in packaging and labelling. Products must refer to the origin in Naturtejo Geopark. Ana Paula Carvalho, from *Acha Doce Liquors* progressively gained the taste of rehearsing flavours, merging aromas, daring new alchemy, in the production of her handmade liqueurs (Fig. 5 c). These liqueurs tell stories of characters and places narrated by alchemy, such as the geoliquors Ore, Gold, Earth Depths whose flavours transports to remote geological memories and mining experiences in the surrounding area. In 2016, during the Portuguese participation in Strasbourg Christmas Market, Acha Doce hot wine, a secret recipe with liquor, was considered the best from the whole fair, and around 2.000 litres were served.

*Casa dos Xarês*, a Rural Tourism unit located in the area of Tejo International Natural Park and UNESCO Biosphere Reserve, manufactures geoproducts appealing to the senses to present the landscapes. Hot Schist is a hot chili sauce in whiskey that reports to the extreme and breath-taking heat of the region during summer and to the metamorphic terrain where the hot chili pepper grows. Tagus Aurifer, inspired on the famous gold from Tejo River since ancient times and especially during the Roman period, is olive oil produced with olive trees that grow overlooking the river and flavoured with rosemary and oregano, also from the garden (Fig. 5 d). Casa do Xares reconstituted the Geopark mascot, Justice, the Trilobite, with 100% reused materials and exhibits it in the facilities.

*Gaspar & Fernandes Bakery*, designated as Geobakery, is a family heritage that joins ancient knowledge and high-technology to produce traditional bread (Fig. 5e). Conventional bread and 100% organic bread (made without yeast, but with "old dough") are produced with the highest quality ingredients, cooked in wood ovens, preserving traditional recipes but with the most advanced technology.

In the words of the pastry chef and cake designer Ramos, the "Geocakes project was born out of my passion for the art of pastry framed by the region I chose to develop ... I am obviously talking about the Naturtejo UNESCO Global Geopark, assuming the important contours of the gastronomic affirmation of an entire region."

From its atelier and production unit, close to the Ponsul's Fault geomonument, in Idanha-a-Nova, geoproducts such as Trilobites, Daedalus, Rosas Albardeiras (peony roses) cookies come out every day, among jams, preserves or traditional cakes and many others (Rodrigues et al. 2017; fig. 5f). The main principles of Geocakes, a family project, are the preservation of natural, cultural and environmental resources, as also the rural areas development.

Regarding the production process, waste management is carried out, based on the separation of waste. The energy production is mostly done through renewable sources, such as solar energy for electricity and water heating. Considering the importance of rural areas and the potential of the territory, Geocakes developed a packaging that promotes a positive image of the countryside and of the region where the owners have chosen to live and to create their business based on social, cultural and environmental sustainability. Organic certification is being implemented, due to a

great concern with sustainable agricultural practices, with some products already certified and other in process. The approach km 0 with the use of local resources has not only economic advantages but also promotes the protection of ancestral knowledge that is part of the culture of the region. Local partnerships are privileged, as long as they share the same ideals and quality standards. Geocakes uses products of excellence, preferably local, in their essence, whenever possible in its purest state, such as unpeeled fruits in jams and recipes that respect and promote cultural identity and traditions of the local community. Culinary techniques are used that honour and highlight the potential of traditional ingredients and recipes. Geocakes, also with GEOfood brand, combines ancestral and traditional recipes and flavours with innovative approaches that reach several market targets. The company's current and biggest challenges are to segment the offer, reach the target markets, bypass the location in a low-density territory and keep up with the market instability, through the presentation of their products in selected online shops.

The wine "*Herdade do Escrivão*", one of the first wines with Organic Certification in Portugal, is produced in Tinalhas from metasedimentary related soils. The company also produces olive oil, vinegar, dried tomato, olives and bell pepper pasta, among other agri-products (Fig. 5g).

Following a family passion of Luís Farinha, the beekeeper, *Mel Doce Paixão* produces honey in several places in Proença-a-Nova, like the Corgas Geomorphological Viewpoint geomonument. In a mountainous and forested environment, bees harvest the most varied nectars of excellence, from native plants such as rosemary or heather, which they use to make the delicious honey (Fig. 5 h).

*Nature Fields* raises cattle in an extensive and organic system, in natural meadows located in Idanha-a-Nova, Castelo Branco and Penamacor, within the Naturtejo Geopark. The region has very favourable conditions for organic livestock and organic production systems, where animals are well adapted to the environmental circumstances. The diversity of pastures in this region gives the meat its unique flavour and characteristics, marketed under the brand 'Geo Do Prado' (meaning Geo Meadow, Fig. 5i). In 2018 Nature Fields was prized with the National Agricultural Production Award 2018.

*Rodoliv* is a regional olive oil cooperative that gathers local producers with traditional extensive olive groves from Tejo River shale-carved valley and alluvial terraces (Fig. 5j). At a time when there is a huge growth in consumption, this brand promotes Portas de Ródão Natural Monument in the label, the iconic epigenic gorge, one of the Geopark's most symbolic geomonuments with a very important cultural meaning for local communities.

*Trevo Extravagante* is a family-run farm, located in Vale de Pousadas, a few kilometres from the Tejo River, that produces a wide variety of authentic, traditional and homemade products, such as cheese, olive oil, olives, regional cakes, sausages, honey, among (Fig. k).

*Vale de Aromas* (meaning Valley of Scents) produces olives and olive derivatives (canned olives, olive paste, flavoured olive oil and extra virgin olive oil), in Vale de Pousadas, underlying olive groves as a significant part of the cultural landscape of the Naturtejo Geopark (Fig. 5l). If, in remote times, gold miners turned those alluvial terraces in search of gold, nowadays the liquid gold of the Tejo River comes out of the



precious hands of oil mill masters. The company also produces herbs and honey and pollen, extracted from the wide variety of native flora that paints the fields in Spring.

*Súbito Geowine*, from Viniregra, is one of the early geoproducts in Naturtejo Geopark launched in 2009 (Fig. 5m). It is produced around the village of S. Miguel d'Acha in lands that benefit from the unique orographic (peneplain) characteristics, temperature and precipitation. Granite-derived sandy soils, resulting from the weathering of granite rocks dated 310 million years ago, provide the nutrients the fruit needs.

*Aromas do Valado* was officially created on April 1, 2013 (Fig. 5n). The company was born from a deep love for nature, for the aromas and for the benefits of plants that provide us with tranquillity and well-being. It is based in a farm, located in Segura (Idanha-a-Nova), just 7 km from Spain, in the so-called Raia (border), nearby Tejo Internacional Natural Park (Vinagre, 2015).

It has organic certification by ECOCERT, for plants cultivation and for essential oils and SATIVAcareBio for hygiene and cosmetic products. The composition and labels of essential oils and synergies are submitted to the Anti-Poison Information Centre, a mandatory condition for the commercialization of those products. The company has also the Geoproduct brand, an added value very appreciated by customers and partners, mainly in the international market.

With a deep respect for nature and environment *Aromas do Valado* soaps are traditionally produced, with a manual process and with 30 to 40 days of cure (approved and registered into Cosmetic Products Notification Portal from European Commission). Their delicate formula was achieved through a meticulous combination of olive oil, vegetable oils and butters, with organic certification, that give to the skin moisturizing, nourishing and soothing properties. The natural aromas, which perfume the soaps, come from hydrolates (floral waters) and essential oils extracted from the indigenous plants of the region and which have a chromatographic analysis that attest the purity of their composition. The indigenous plants for the distillation of essential oils are harvested in a traditional way, using the scythe or pruning shears as a cutting tool. With a great diversity of products, within the categories of hygiene and cosmetics and well-being, *Aromas do Valado* has more than 30 product references on the market.

In Portugal, *Aromas do Valado* is present in more than 40 places, mainly in organic shops, parapharmacies and tourist shops. Internationally it is selling in countries such as France, Spain, Belgium, Czech Republic, Switzerland and Japan, where the Geoproduct brand is one of the main strategies for highlighting and selling products. *Aromas do Valado* participated in a territorial valorisation project, with the Polytechnic Institute of Castelo Branco, aiming the promotion of indigenous plant species and its innovative use in gastronomy (Gonçalves et al 2017). From this work resulted a strong partnership between *Aromas do Valado* and Geocakes, and innovative products such as lemon cookies or Peony cookies were produced with essential oils.

The whole basic philosophy to the creation of the company, the sustainable use of natural resources, the synergy between innovation and tradition, the environmental practices, the establishment of local partnerships and the shared values with the Naturtejo UNESCO Global Geopark led to the assignment of the designation GeoCompany.

*Amo Produto Local* (= Love – Local Product) is a gourmet basket which combines local products from different producers within the entire Naturtejo Geopark territory

(olives, jam, olive oil, potter and others) with a Geoproduct exclusive packaging (Fig. 5o). The company started with an academic research in Management, which resulted in the whole strategy, designed to foster rural area and low-density area (Jóia 2011, 2012).



Figure 5 – Examples of Naturtejo Geopark Geoproducts: a) handmade trilobite line of jewellery, by Paulo Dias; b) handbag and slippers in handmade wool fabric, by VÓNô; c) Acha Doce Liquors, d) Tagus Aurifer flavoured olive oil by Casa dos Xarês; e) bread by Gaspar & Fernandes Bakery; f) trilobite cookies, by Geocakes; g) Herdade do Escrivão

wine; h) honey, from Mel Doce Paixão; i) Geo Do Prado cow meat; j) Rodoliv olive oil; k) cheese from Trevo Extravagante; l) olives and olive oil from Vale de Aromas; m) Súbito Geowine; n) soaps and essential oils from Aromas do Valado; o) Amo Produto Local gourmet basket.

#### 4.3.3 Tourism facilities

Tourism facilities are often the "gateway" to the territory of Naturtejo Geopark, so they are important partners in providing quality information (personal or with maps, leaflets and thematic decoration). Tourist facilities are also privileged places for the combination of geoproducts and GEOexperiences, making trips unforgettable. They include in the decoration of the spaces traditional elements and photographs that represent the singularity of Naturtejo Geopark territory and especially the relationship with the place they are located. These places take advantage of balconies, windows, terraces with panoramic views creating real viewpoints.

Restaurants must privilege regional gastronomy, presenting the ingredients and its origin, using food geoproducts, geodishes or geomenu. In Monsanto Village, "the most Portuguese village", surrounded by tardivarian granite boulders, the first *GeoRestaurant* - "*Petiscos & Granitos*" (meaning Dainty & Granites) was developed in Portugal and one of the earliest in the world (Fig. 6a). The reputed restaurant, also certified with GEOfood brand, was built among gigantic granite boulders in 2007, providing traditional dishes focused on the best local and seasonal ingredients and a geomenu with Boulders Soup. With a 'balcony for the vastness', it is a real viewpoint to understand the main geomorphological units of the Geopark (Rodrigues & Neto de Carvalho 2009).

Accommodation units include all possible typologies (from B&B to Hotel) and where the Geopark has a strong presence, for example using local themes (fossils, mines, mountains, etc), which offer an unique and integrated experience, so that tourism is totally immersive in the UNESCO territory.

*Monsanto GeoHotel School* is a contemporary hotel in a historical village, a space that fosters the enjoyment of the landscape, taking advantage of Monsanto's natural and cultural resources (Fig. 6b). The hotel is managed by Idanha-a-Nova municipality together with the Polytechnic Institute of Castelo Branco, combining academic training of the students with practice (Garcia & Filipe 2017; Farinha et al, 2019). Monsanto GeoHotel is a gateway to the Geopark that reveals an exceptional territory, built over time among granite boulders in the steep slope of a gigantic inselberg. The decoration transports the guest inside the hotel to the local culture, geomorphological landscapes, granite colours and textures, of Monsanto geomonument. The elevator ride is "...an icebreaker!" that introduces the guest in the geology of Granite landscape of Monsanto.

The old community oven of Salvaterra do Extremo, abandoned for decades, gave place to the *GeoHostel "Casa do Forno"* (meaning Oven House), a Rural Tourism accommodation (Fig. 6c). In addition to comfort and rest, GeoRefuge offers geotourism experiences in the territory and a GeoMenu that combines the flavours of the region with innovative approaches, in a welcoming environment totally dedicated to the landscapes, geodiversity and memories of the Naturtejo Geopark (Geraldés & Ferreira 2009; Ferreira & Geraldés 2011).

Casa dos Forno was a pioneer in the development of geoproducts in the Geopark, since the Geobakery where the first Geo cookies in Naturtejo Geopark (Trilobites) were created. There is a delicious GeoMenu to “taste geodiversity” with “Slices of the Earth” pizzas, orogenic toasts, volcano breads, salted Shales or the egg cream Cliffs, a regional dessert adapted to Salvaterra do Extremo landscape (Rodrigues & Neto de Carvalho 2009). Combining imagination and originality with local geodiversity the GeoHostel offers a full Geopark experience where the decoration, the rooms, the food and the tourism activities present the local geodiversity. This company became nationally famous for the TTransGeopark, an annual tourist off-road weekend, distinguishing itself by its environmental concern and the strong cultural elements. It has crossed the Geopark territory in different directions and subjects, with geological interpretation, discovering trails, geosites and authentic experiences (Ferreira & Geraldés 2011).

#### **4.3.4. Tourism related services**

Tourism related services include companies that provide recreational, sports, open air, cultural and other tourism services. They must demonstrate in its activities the fully respect for the environment and heritage. These companies also cooperate in environmental surveillance and monitoring of trails and other infrastructure. The monitors of these companies must have not only, generic training about the Geopark, but also specific skills in natural and cultural heritage interpretation provided by Naturtejo Geopark.

*GeoLife* and *ActiGeo*, both located at the village of Monsanto Inselberg Geomonument, promote geotourism activities, tours in geosites and other Geopark destinations. Trained guides, from the local community, provide interpretation of landscape and geodiversity (Fig. 6d,e).

*Manuel Teixeira Stud Farm* (Geo Stud Farm) raises “Lusitano” Purebred Horses, widely recognized and awarded worldwide, using modern technologies in order to privilege the well-being of animals, following strict standards for the preservation of the breed (Fig. 6f). The Stud Farm promotes the local identity of the region, in the Naturtejo Geopark, where horses are raised in freedom in the wide fields of Penha Garcia, raising awareness of the importance of preserving the Lusitano Horse, as testimonies of the evolution of the horse family and whose record is preserved in the geological record of the Naturtejo Geopark at Foz do Enxarrique site.



Figure 6 - Examples of Naturtejo Geopark Geoproducts: a) GeoRestaurant - “Petiscos & Granitos”; b) elevator with granite decoration in Monsanto GeoHotel School; c) GeoHostel “Casa do Forno”; d) Geolife outdoor company logo; e) ActiGeo outdoor company logo; f) Manuel Teixeira Stud Farm “GEOcoudelaria”.

#### 4.4 Promotion

Geoproducts have been present in a wide range of Naturtejo Geopark activities, including familiarization trips to tour operators and journalists to production units, tastings and workshops as well as presentations, fairs, festivals, specialized markets, trade shows for professionals in Portugal and abroad. They are included in the “Geopark Tours”, combined with the tourism offer organized in packages. In the very competitive national and international tourism market, Naturtejo Geopark has developed a strong promotion and marketing strategy, that has included the organization of 55 familiarization trips bringing more than 400 tourism operators and journalists to the territory. On the other side, the Geopark has been present in national and international tourism fairs, such as the BTL – International Lisbon Tourism Fair, FITUR, the International Tourism Fair in Madrid, or ITB - Berlin, one of the world’s leading tourism fairs, whose joint participation of UGGps is coordinated by Naturtejo Geopark (Neto de Carvalho et al. 2016; Frey et al. 2018).

Besides tourism fairs, Naturtejo Geopark has been promoting especially geoproducts in specialized trade markets such as the Biofach, at Nuremberg, the largest fair in Europe on organic food and sustainable production, at Portuguese National Agriculture Fair or at Green Fest, Portugal's largest event dedicated to sustainability. Geoproducts also attracted great attention in the Strasbourg Christmas Market, in 2016, where several Naturtejo’s certified geoproducers sold directly their products, in a 35 days event visited by 2 million locals and tourists.

Geoproducts are present in all the Geopark official events, in catering services, meals, showrooms and exhibitions; the tourism facilities and services are preferred choices for invited guests, press and fam trips. Geoproducts are promoted in the geopark’s

website and social media, in printed and digital promotional material and in Geopark's press releases. Geoproducers can present or be represented at regional, national and international and trade fairs (tourism, gastronomy, agriculture, geoparks, UNESCO, and others) benefiting from differentiated promotion in emerging markets. Producers can take advantage of cross promotion and promotion through EGN and GGN.

Several Geoparks have mascots, as Andi Andesite from Hateg Country Dinosaurs, Willi Basalt from Vulkaneifel, Obit from Langkawi, Geopaca from Villuercas-Ibores-Jara, Rupko from Papuk, Geomaru & Nuna from Itoigawa or Judite - the Trilobite, from Naturtejo. Judite is an amusing trilobite soft toy, symbol of the geological heritage of the Geopark, responsible for the most common fossils found at the Geopark's fossil geosites – the trace fossil *Cruziana* representing their daily life activity - that attracts the attention of children and adults. Judite – the Trilobite participates in local economic fairs, thematic festivals and international promotion events such as tourism trade shows to raise awareness of the professionals and visitors about the Geopark. It also represents an opportunity to rise the attention of participants towards the Geopark's geoproducts.

## 5. Conclusions

The comprehensive analysis of the several strategies used by different UNESCO Global Geoparks allows to conclude that geoproducts have direct and indirect economic impact and therefore are strategic for local development and geotourism activity in these territories. They can be defined as products and services based on geodiversity from the territories.

Geoparks put a lot of effort into developing their brands, supporting the creation of new products, connecting these products to the geological heritage and fostering the engagement of local communities. The GEOfood common brand also shows that UNESCO Global Geoparks are looking to promote their products internationally and using common tools.

As a result of a work carried out in the last 14 years Naturtejo UNESCO Geopark has been improving its strategy for developing geoproducts, with specific criteria. The assessment of the best practices allowed to overcome difficulties and create a systematic methodology for geoproduct implementation. The Geoproduct brand developed recognizes the origin of the product in this UNESCO territory, where geodiversity and geoheritage are central. Besides the connection with the local heritage the certification requires that: (1) the Geoproduct companies must be located in Naturtejo Geopark territory, (2) a significant part of the raw materials come from the Geopark, and (3) the production is made in Geopark.

Detailed analysis of the examples of geoproducts from other territories allowed to propose the strategy for the development of geoproducts in Naturtejo UGGp, but also inspired local communities and companies to create their own products. Geoproducts were divided into categories, considering the type of products and services: (a) handicraft & merchandising; (b) food, cosmetics and others: geological products, land products, handmade food products and small processing units, cosmetics and others; (c) tourism facilities: restaurants, accommodation, selling points; and (d) tourism related services: tourism companies and other tourism services. Specific criteria and guidelines were created for each sector in order to foster the connection between Geopark's geodiversity and the products.

The communication strategy adopted in Naturtejo Geopark, where geoproducts demonstrate that their singular and differentiating characteristics result from the geological context, can trigger curiosity and engage 'consumers', in formal or informal education environments, making geosciences more accessible and fostering the understanding of geodynamic processes of global scale. Geoproducts are innovative education and communication tools used in Geoparks, that tell stories, illustrate landscapes, teach curiosities and bring memories.

To reinforce the consistency of geoproducts it would be important to UGGps to adopt a common definition and homogenize procedures, maintaining the identity and specificities of each territory. It could facilitate the definition of impact assessment indicators that would allow evaluating the effectiveness of the strategies and the economic e social impacts generated by UNESCO Global Geoparks. The methodology presented here could be the basis for a common approach and a starting point for the evaluation of geopark's local development strategies.

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