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Introduction

The Geoheritage Structure Within the World's Geoparks: Tension in a Multiplicity of Cultural, Economic and Scientific Contexts

The international consideration of geological heritage conservation has been relatively late in relation to the many decisions taken for nature protection/conservation. For example, the first international symposium on the protection of geological heritage held in Digne-les-Bains (France) in 1991 was co-organized by the European Working Group on Earth Science Conservation (EWGESC) founded in the Netherlands in 1988. The International Declaration of the Rights of the Memories of the Earth (1991), signed on this occasion, refers to “the memory of the Earth” to stimulate public interest in respect and *in fine*, the conservation of this heritage has, according to Jones, formed the philosophical basis for the future Geopark program (Jones 2008, p. 274). In 1993, in Mitwitz-Cologne (Germany), the EWGESC became The European Association for the Conservation of the Geological Heritage, better known by its acronym (ProGEO) and it will continue to be involved in the conservation of the geological heritage. However, several authors point out that the idea of creating geoparks emerged at the 30th International Geological Congress in Beijing in 1996 (Zhao and Zhao 2003, p. 391; Zouros 2004, p. 165; McKeever and Zouros 2005, p. 274; Du and Girault 2018, p. 6). The Geoparks Program, presented in 1999 within UNESCO to draw attention to geological conservation as a separate entity to complement the World Heritage

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Convention and the Man and the Biosphere Program proposed the following definition:

“As recommended by the expert meetings, a geopark will be a dedicated area enclosing features of special geological significance, rarity or beauty. These features need to be representative of the geological history of a particular area and the events and processes that formed it” (UNESCO, 156 EX/11 Rev. 1999, p. 2).

Subsequently, the focus of the new geopark concept on the joint consideration of geosite heritage and local development, particularly through geotourism, was confirmed in the charter of the European Geopark Network (EGN) signed in 2000. The EGN was then largely inspired by the LEADER II program (Links between actions for the development of the rural economy)¹, whose approach involved a rural development methodology based on a number of key factors including partnership, pyramidal territorial development, innovation and cooperation².

Du and Girault analyzed the many negotiations that have taken place, in particular with the International Union of Geological Sciences (IUGS), the International Geoscience Program (IGCP) and the International Union for Conservation of Nature (IUCN), in an attempt to integrate the Geopark Program into a UNESCO program (World Heritage, MAB Program) (Du and Girault 2018). We will not detail here the elements of this analysis that provide a better understanding of the reasons for the failure of these various proposals for integration into an existing UNESCO program, but we will propose a summary outline (Figure I.1).

However, this figure already highlights one important piece of information, namely the parallel evolution of geoparks in two regions of the world, Europe and China. These first global geoparks merged in 2004 with the creation of the Global Geopark Network (remarked later in this GGN book), which led to the creation of many geoparks during the 2000s. Nevertheless, since they did not benefit from UNESCO’s budgetary support, geoparks were forced to be established on the basis of the political will of local authorities with long-term financial support (GGN, *Operational Guidelines*, 2006, 2008). Following this period of rapid growth, it became clear that Global Geoparks were, at that time and still today, almost all located in the two founding regions of the GGN, namely Europe and China (Figure I.2).

1 See www.adourchalossetursan.fr/Nos-missions/Le-programme-LEADER/LEADER-c-est-quoi.

2 See European Commission archives: http://enrd.ec.europa.eu/enrd-static/general-info/faq/rd-regulation/fr/rd-regulation_en.html#method.

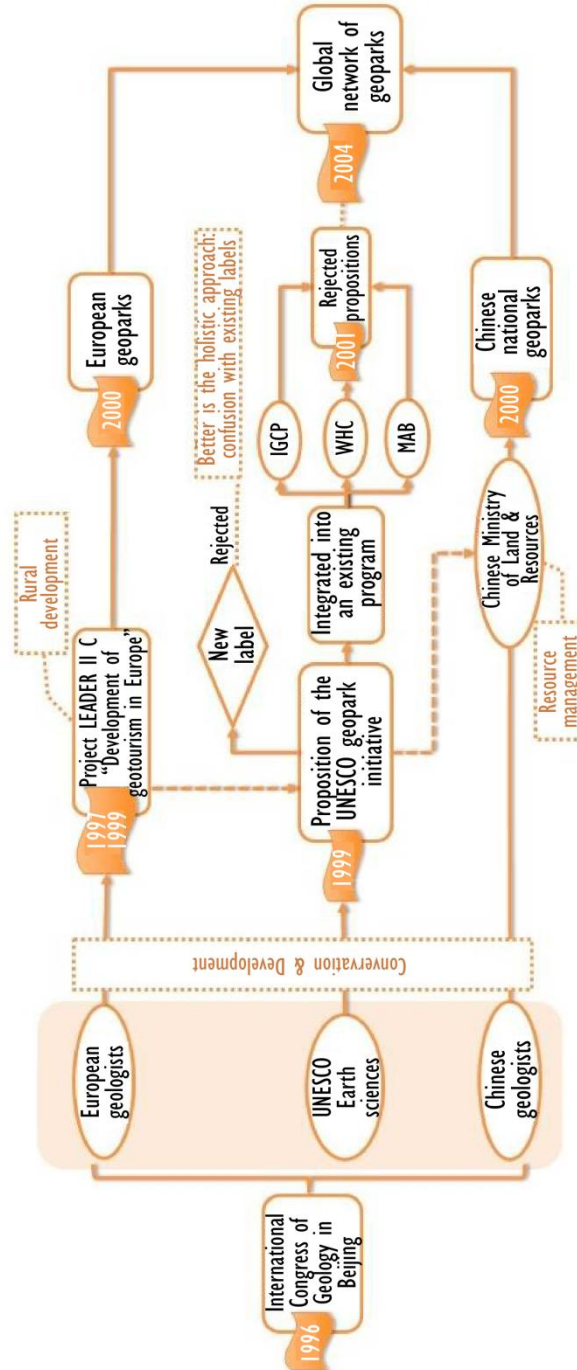


Figure I.1. First step in the emergence of the UNESCO Global Geopark label (source: Du and Girault 2018, p. 9).

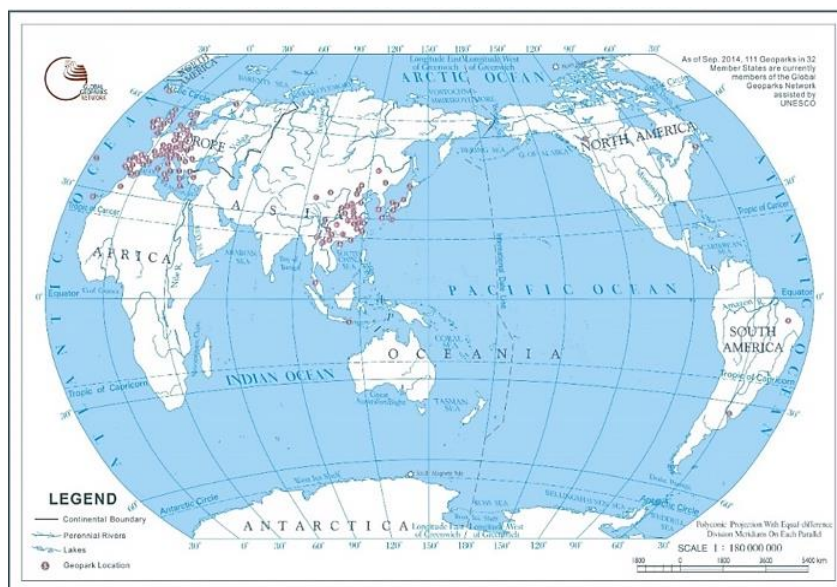


Figure 1.2. Distribution map of global geoparks in April 2018³. For a color version of this figure, see www.iste.co.uk/girault/geoparks.zip

It was in 2012, following the consultation of a map of the two-pole distribution of global geoparks, and without knowing the conditions for their creation, that I first asked myself the first questions about geoparks. Did the financial and/or administrative and scientific constraints related to the design and drafting of the application file significantly hinder its creation in countries with fewer resources? Was it possible to foresee a convergence with what Icomos had already pointed out for the strong imbalance in the distribution of the list of World Heritage sites (between 1987 and 1993)⁴?

This international association then highlighted causes of structural (i.e. related to the inscription procedures, as well as the management and protection of cultural property) and qualitative (i.e. related to the way in which properties are identified and evaluated) origins. Were there also geopolitical parameters, particularly given the absence of geoparks in North America, that could explain this distribution?

Working within the Local Heritage and Governance research team, I was particularly interested in this observation, which undeniably highlighted global

³ See www.globalgeopark.org.

⁴ See World Heritage Information Kit, 2008, p. 15.

geoheritage governance problems and which could illustrate, on a large scale, one of the themes of this team's annual seminar: Heritage Ambivalences in the South, Staging and Actors' Stakes?⁵. This observation and these first questions led me, in 2012, to organize the first seminar session on this subject⁶. To better understand the challenges of creating geoparks, we first wanted to analyze the evolution of ethical issues in public environmental policies (Sauvé and Girault 2014), focusing also, and more specifically, on the analysis of the ethical issues of two pioneering organizations in the history of international relations in the second half of 20th Century, namely UNESCO and the Council of Europe (Brianso and Girault 2014). This first work and the growing interest in this research topic led us to respond collectively, in 2013, to a call for tenders for a H2020 program, which has been accepted. Some of the main works of this are the subject of this collective work.

1.1. The Geopark H2020 program

The progressive recognition of global geoparks by UNESCO has therefore prompted various countries to implement development strategies in line with the good practice management recommendations of international organizations, as previously implemented with the MAB and WH labels. As of October 2013, there were 100 global geoparks and some of these areas included both natural and cultural World Heritage sites (McKeever *et al.* 2013). In 2013, only the Asian continent obtained Geopark listings (Vietnam, Malaysia, Korea and Indonesia) with a very high concentration in China (29). Latin America only had one geopark (in Brazil) and the African continent had no sites at the time despite several attempts. Indeed, in 2009 the African Association of Women in Geosciences (AAWG) created the African Geoparks Network (AGN), one of whose objectives was to promote and raise awareness among local communities of the need to protect and enhance African geological heritage through the creation of geoparks for sustainable local development. These UNESCO policy initiatives, designed to study, protect, conserve and manage cultural and natural heritage, have been based on a new vision of integrated heritage management that includes nature, culture and civil society as forms of global sustainable development for future generations. In view of this observation⁷, the initial objective of the Horizon 2020 program, entitled "Geopark", was to study two geographical areas (Morocco/Spain) facing heritage management

5 This seminar subsequently led to the publication of a collective book (Guillaud *et al.* 2016).

6 Two other colleagues also took part in this seminar, Patrick de Wever and Isabelle Brianso. Both subsequently participated in the work of the H2020 Geopark program.

7 Statement from the Marie Skłodowska-Curie Actions Research and Innovation Staff Exchange (RISE) application file, Call: H2020-MSCA-RISE-2014 PART B "GEOPARK" (2014, pp. 5–6).

based on European models (Charter of European Geoparks) such as the Central Geopark of Catalonia (Spain) included in the GGN membership list in 2013 and the Zat Valley in Morocco⁸, a country that at the time did not have a GGN and that wished to obtain this label in order to strengthen socioeconomic development and local vitality⁹. The GGN, which focused the objectives of the geoparks on spectacular geological heritage, territorial development (particularly through geotourism), biodiversity, the environment, ecology and education, required the drafting of a scientifically well-founded application file. Paradoxically, the international experts who analyze the dossiers of the *aspiring geoparks* were increasingly aware of the involvement of local actors (population, civil society, etc.) both in their investment in the preparation of the application file and in the implementation of an adapted management plan following a sustainable global development (geo-biodiversity, the environment, culture, geotourism and society). Undoubtedly, some countries that did not seem well-prepared to cope with this cumbersome methodology to obtain the GGN label have called on heritage brokers (often GGN expert geologists) or, more often than not, have given up preparing a long and expensive application file.

With a wide range of skills in the human, life and earth sciences, the partners in the Geopark H2020 program, which are part of various research institutions, the National Museum of Natural History of Paris (France), the Autonomous University of Barcelona (Spain) and Cadi Ayyad University (Morocco) and a private company (Cerdan), while relying on the two case studies selected, analyzed the problems encountered (scientific expertise, establishment of participatory inventories, local development based in particular on geotourism, co-management with local populations, in particular in the implementation of an interpretation plan, etc.). This preliminary work should also lead them, in a second step, to propose innovative and interdisciplinary methodologies for the co-design, with local populations, of a project to apply for the UGG label and its subsequent management that could be adapted in various countries.

8 The Zat Valley is located in the Moroccan High Atlas about 60 km from the city of Marrakech (World Heritage City, 1985). Covering an area of 452 km², the valley is crossed by the wadi Zat, areas of medium and high mountains (highest point: Jebel Meltsen, 3,600 m altitude), and the high plateau Yagour. With a semi-arid climate and Mediterranean and mountain vegetation, the Zat Valley is based on traditional agricultural activity that barely allows the rural population to provide for itself. Like other valleys in the High Atlas, it has a very rich and varied geological, ecological and archaeological heritage, including the rock carvings of the Yagour (Bellaoui, 1989).

9 Morocco became the first Arab and African country to join the GGN with the creation of the M'Goun Geopark, which was awarded the "Global Geopark Network" label at a ceremony held in Canada in September 2014, after the deadline for submitting our application.

Before presenting some of the main results of this H2020 Geopark program, which are the subject of this book, let us go back in time to the evolution of the institutionalization of geoparks around the world (Du and Girault 2018), which has had a significant impact on this research program.

I.2. A year of upheaval in the initial program

More specifically, in 2011, at Uruguay's request, the idea of providing concrete support to ensure a more balanced distribution of geoparks on a global scale was discussed by UNESCO. We have already shown (Du and Girault 2018, p. 11) that in 2013, four options for formalizing the relationship between global geoparks and UNESCO were put forward and discussed by the Working Group (WG) on the Global Geopark: (1) *status quo*, (2) *GGN becomes an NGO which in turn becomes formally associated with UNESCO for particular projects via a memorandum of understanding*, (3) *an intergovernmental program* and (4) *an initiative with a light administrative structure* (UNESCO, 192 Ex/9, 2013).

In November 2015, at the 38th session of UNESCO's General Conference, the International Geoscience and Geoparks Program (IGMP) approved the creation of a new UNESCO Global Geopark (UGG) label (UNESCO, 38 C/14, 2015) (Figure I.3).



Figure I.3. Diagram of the final stages of negotiations to create the UGG label (source: Du and Girault 2018, p. 12)

The Global Geopark Network (GGN) therefore integrated the UNESCO Global Geopark label (UGG) at the end of 2015 as part of its “Main line of action 4: Fostering international science collaboration for earth systems, biodiversity, and disaster risk reduction”, at the same time as the MAB program. “The UNESCO-supported Global Geoparks Network promotes the establishment of sites of outstanding geological value which are the basis of local sustainable development” (UNESCO, 37 C/5, 2014, p. 95).

In addition to the objectives related to the promotion of sustainable development, Du and Girault stressed the fact that a new *peace-building* role (particularly in Africa and Latin America) has been added to the global geopark mission, probably with the objective of joining UNESCO's founding missions (Brianso and Girault 2014; Du and Girault 2018): "International collaboration to develop common pathways to manage the earth's resources is central to the mandate of UNESCO in science, and not only contributes to sustainable development but also to building a culture of peace and dialogue" (UNESCO, 37 C/5, 2014, p. 95)¹⁰. Particular attention was also paid to regions of the world where there were few or no UGGs, particularly in Africa, Latin America and the Caribbean, as well as South Asia and South-East Asia and the Pacific, especially in small island developing States (SIDS).

As a result, the program's performance indicator no longer seemed to be the number of new sites and transboundary sites, but rather the number of Member States that have created new UGGs, with a target of 16 Member States, including two in Africa (UNESCO, 37 C/5, 2014, p. 95). More specifically, for the period 2014–2017, there was a plan to create at least 40 new global geoparks, including four transnational geoparks, notably in Africa and Latin America (UNESCO, 37 C/5, 2014, p. 96).

However, it seems to us (Du and Girault 2018, p. 14) that in reality this second wave of geological heritage institutionalization was not only manifested during the preparation of the IGMP, which itself reoriented global geoparks around the three axes of UNESCO's activity (science, education and culture), but was also accompanied by increased attention from conservation communities. Indeed, a UIGS *task group*, "GeoHeritage", was launched and has been led since 2010 by Patrick de Wever, professor at the French National Museum of Natural History and member of the European H2020 Geopark program, with the aim of enhancing geological heritage through an inventory and legislative approach. In parallel, IUCN and the World Commission on Protected Areas (WCPA) have established a Geoheritage Specialist Group (GSG) to work on the conservation of geological heritage in protected areas.

Gradually becoming aware of this whole context of geopark institutionalization leading to the creation of the label at the end of 2015, it seemed impossible for us not to take it into account in the framework of our research program even though we still had three years of operation.

¹⁰ The objective of creating cross-border geoparks was also part of "Global Priority Africa" for its "Flagship1: Promoting a culture of peace and non-violence" and for "Flagship 4: Fostering science for the sustainable management of Africa's natural resources and disaster risk reduction".

However, and as David Berliner and Chiara Bortolotto point out (Berliner and Bortolotto 2013, p. 19), “UNESCO’s heritage policies are difficult to grasp because of the scope of their applications and the complexity of the mediations through which they are created, translated and appropriated in a plurality of contexts”. We therefore had to broaden both our research avenues (anthropological, ethnological, economic, educational approaches, etc.) and our fields by opening up to China, which plays a leading role in the current development of geoparks.

This is why we have brought together research colleagues working in other regions of the world (Beijing Normal University, University of Mexico), and colleagues from various research institutions in France (New Sorbonne University, Paris Diderot University, Aix-Marseille University, Avignon) working in very complementary disciplines to try to take a critical look at this development of geoparks in the world while promoting privileged contacts with colleagues working in existing geoparks (UGG of Lanzarote and el Hierro, Spain). Finally, we have integrated a new private company specializing in heritage photography, which offers 360° and gigapixel interactive virtual tours of sites, particularly archaeological sites¹¹.

These are, therefore, some of the main results of this research that are presented in this book structured into three parts¹². These various contributions question again the aims of the UGG in terms of heritage conservation, participation of local populations, local development of a territory and its enhancement through heritage interpretation.

I.3. The UGG, a tension between territorial development and heritage enhancement

UGGs are “geographical areas in which sites and landscapes of international geological significance are managed to promote local development by proposing geotourism activities and by enhancing the territory’s heritage”¹³. While these territories often do not have their own legal status conferring on the local, regional or national legislation of each country in which they are located, the right to protect these sites, the 140 geoparks, which in 2018 held the UGG label, must nevertheless

11 www.martinloyer.fr/tag/visite-virtuelle.

12 We have selected only some of the most comprehensive original work done during these four years, which has resulted in many other works. For more information on the entire program, see: <http://geopark.mnhn.fr/>.

13 Definition given on the official website of the UGG, accessed 2 November 2018, www.unesco.org/new/fr/natural-sciences/environment/earth-sciences/unesco-global-geoparks/.

be managed “according to a global concept of protection, education and sustainable development”¹⁴. As several contributors of this book point out, geological heritage or geoheritage (in their various meanings), which is now part of UNESCO’s international governance, is subject to strong, often contradictory, injunctions between its enhancement “as the concrete expression of museum interpretation in the form of exhibitions of panels” (Desrosiers 2011, p. 108) and/or their valuation, a term used “by those who support the functional approach [such as] developers, tourism operators or economists” (Davallon 2006, p. 53), which is considered as “economic reasons” (Di Méo 2008, p. 1). Thus, while scientific experts (mainly geologists) have most often been at the heart of the process of creating geoparks, some current tensions arise from asymmetries between groups of stakeholders (politicians, managers, scientists, representatives of local populations), particularly for the preparation of heritage inventories and the implementation of projects for the interpretation of the territory/economic development of these heritages.

It is also worth noting that in most of its recommendations, and in particular in its texts defining geoparks, UNESCO intends to take into account “local communities” and stakeholders, with a view to participation, all in a movement supposedly led by these communities (*bottom-up*). However, research on the analysis of participatory experiences in the context of World Heritage parks highlights significant differences between statements of intent and what can be observed from field surveys. This is what Igor Babou shows based on two field studies. After having taken stock of the theoretical questions on the difficulties of defining the participation of “local communities” and on the critical assessment of participatory and environmental democracy, this author identifies the problems encountered within geoparks and in particular some of the fundamental questions to be asked. Where did the initiative to create a geopark come from? Who are the manufacturers? How do we define the local communities concerned by the creation of a geopark and how do we analyze the possible benefits in terms of quality of life that they will (or will not) have as a result of this creation? How can we also take into account the opinions and desires of local populations, which are not limited exclusively to economic, political and cognitive aspects, but sometimes to sensitive dimensions? He concluded his study with a brief presentation of the first results of an investigation carried out within the Lanzarote UGG (Spain), stressing in particular that due to a very rapid project set-up (in about two weeks), it was designed by a very small team of experts.

The first question formulated by Igor Babou, from which the initiative to create a geopark originated, is largely taken up and analyzed by Catalina Gonzalez Tejada and Yves Girault, on the basis of the experiences of 40 actors involved in the

14 Information collected from the official UGG website, accessed 2 November 2018, www.unesco.org/new/en/natural-sciences/environment/earth-sciences/unesco-global-geoparks/.

creation of 11 Spanish UGGs. While mobilizing the concept of “mental territory” (Mayrand 2004, p. 49) to refer to the process of co-designing an eco-museum with the inhabitants, these authors were interested in analyzing the aims and values that motivated the creation of Spanish geoparks by studying their impacts in the initial phase of the conception of the territory story (Mayrand 2007). After presenting the evolution of the consideration of geological heritage conservation in Spain, and based on the fact that there are currently four definitions of geoheritage in Spain, they first highlight the existence of an epistemological conflict relating to the relationship to geology. Subsequently, and depending on the definition to which these managers of Spanish geoparks referred to during the creation project, they show that the heritage reflection was carried out according to two different logics. The supporters of the disciplinary logic advocate the enhancement of the territory either via the conservation of the geological heritage (UGG within the natural parks of Andalusia, which underlines a strong tension with the territorial development objectives of the geoparks) or via the museum interpretation (Desrosiers 2011, p. 108). The supporters of territorial logic defend the enhancement of geological heritage through tourism.

By analyzing in a more specific way the application of the Tremp-Montsec basin geopark in Spain (labeled UGG in 2017), Fabien Van Geert extends this reflection by focusing on understanding the tourist rationales put in place to create an image of the territory based on local geological outcrops recognized in the scientific community. This geopark project was indeed perceived as the possibility of creating a holistic interpretative discourse of the territory (*origens Pallars Jussà: Viatge als orígens – Pallars Jussà: A Journey to the Origins*), making it possible to highlight its geological heritage from a unique “brand” in Catalonia. This search for a territorial image has led to the development of a holistic narrative that articulates the various heritage assets of the territory, combining archaeology, ethnography, history and earth sciences. According to the managers of the Tremp Geopark, “this approach to geotourism by aiming to go beyond the concepts of ecotourism, cultural tourism and adventure tourism has become synonymous with ‘quality tourism’, respecting nature and the authenticity of the territory, or ‘sustainable tourism’, offering an opportunity for the territory”. However, Fabien Van Geert expresses reservations by wondering whether the holistic interpretative narrative proposed for the territory does not run the risk, by diluting the consideration of geology, of ultimately becoming nothing more than a setting, or even a simple rhetorical discourse at the service of the development of a “quality tourism” favored by managers.

The last two questions formulated by Igor Babou, how do we analyze the possible repercussions in terms of quality of life for local populations and how do we take into account the opinions and desires of local populations, are taken up by Ouidad Tebaa and Saïd Bourjouf. These two authors focus their analysis on the

tensions and dynamics created by the different sets of scales and the relationship to knowledge and territory within the Zat Valley in Morocco. First, they refer to the geographical and disciplinary scale of what is included in the heritage, because the heritage induced by the UGGs is neither limited to a reduced space, nor to the intangible, nor even to geology or landscape, but to all these dimensions captured in their infinite interactions, including the ecosystem and economic, social, cultural and even spiritual life. They specify that the population surveyed is highly sensitive to the delimitation of the territory of a hypothetical UGG because it defines for it the perimeter of deprivation of its ancestral land use rights and that, as an illustration, protection should mainly concern places of worship and respect for traditional community rangeland management (Agdal) as the sole and unique reference system. Their investigations show that any protection project in the Zat Valley must first resolve existing conflicts and that the local authority is undoubtedly the most appropriate authority to coordinate and reconcile the many conflicts of interest that will inevitably arise between elected officials, associations, cooperatives, etc. Ouidad Tebaa and Saïd Bourjoug therefore attest that issues of poverty, lack of economic activity, the state of traffic networks and urban dynamics are fully integrated into the process of heritage development. They then ask themselves to what extent can the patrimonialization (especially of the geological heritage), which becomes a manifestation of territorial policies, make sense to local populations when poverty prevails, with its cohort of misdeeds: migration, lack of adaptation to markets and/or submission to principals, which pushes the ecosystem out of balance. Finally, these authors point out that the long time required to co-construct the territory of a geopark for the safeguarding and sustainable preservation of its resources is categorically opposed to the short time required to meet the pressing expectations of its inhabitants in terms of human and social development. It is interesting to note that Francisco Valdez, in a completely different context, within a UGG in Mexico, comes to similar conclusions.

However, what is really known about the hypothetical economic benefits following the creation of a UGG? To answer this question, we can first refer to the number of people who visit the UGGs. In China, this is easier because entries are not free and some data are therefore accessible. Yi Du and Yves Girault specify in this book that in 2016 there were, for example, 980,000 visitors to the UGG of Dali Mt Cangshan and 3.45 million visitors to the UGG of Mt Kunlunshan¹⁵. Based on the fact that Mount Serrat is one of the main “places of memory” of the Catalans (Balcells 2008), both as a political and a natural symbol – due to its spectacular forms – but also as a religious symbol of their identity, Fabien Von Geert points out

15 These authors point out that the data for these two geoparks come from the geopark’s annual reports. However, the calculation method is not clear for both. Based on discussions with museum staff, it seems to us that the Dali Mt Cangshan Geopark Museum has no data other than group visits that involve the presence of a lecturer.

that this site of the UGG of Central Catalonia hosted, in 2017, 2.7 million people¹⁶. Is it reasonable to pretend, as the managers of this geopark do, that the UGG of Central Catalonia thus welcomes 2.7 million geotourists, even though the vast majority of these people visit this holy place for the Black Virgin, which is kept at the Benedictine Abbey of Santa Maria? As we pointed out (Girault and Le Marec 2016, p. 51), we should therefore first of all be able to analyze the condition of “the public” in geoparks, i.e. to give ourselves the means to answer the question: who is the public in the territories concerned? What are the links between the cultural, scientific and museum structures associated with the life of geoparks? François Mairesse brings other elements of reflection by proposing an analysis of the evolution of economic reasoning on culture and its influence on the development of geoparks. First, it evokes two types of economic arguments that have been used most often to defend the financing of cultural institutions. The first concerns the direct relationship between museum collections (or the research carried out in them) and the results that can be expected by audiences specifically linked to economic production: artists, on the one hand, but also and above all industrialists, producers of manufactured goods or exporters. The second argument, which was very quickly suggested, refers to the fact that museums also provide a service by attracting visitors, particularly foreigners, who will spend their money in the region by extending their stay. By subsequently mobilizing the various economic currents related to culture and heritage, he points out that while the arrival of visitors to a site (such as a geopark) potentially contributes to the economic development of a region, the methods used to calculate the benefits of these operations are at the very least complex to establish, and the results presented are often biased. To clarify this opinion, he refers to numerous studies that, by integrating too much data (local visitors, visitors who would have come anyway, visitors who came for reasons other than visiting the geopark), it had the effect of overestimating, by the multiplier principle, the calculation of the effects induced by this tourist activity. François Mairesse concluded by emphasizing that the reasons given for supporting the financing of geoparks should therefore focus on the real issues in which they participate, namely the preservation of a remarkable heritage, the social role between inhabitants and educational issues, at the risk of tending toward their closure if the economic benefits are not sufficient.

I.4. Inventory and conservation of heritage

The vast majority of the inventory missions we were supposed to carry out in the Zat Valley were carried out using scientific methodologies developed by specialists

¹⁶ Data collected from the Barcelona Provincial Tourism Observatory and relayed by the local press, www.setsetset.cat/noticia/81760/mes-de-2-72-milions-de-persones-van-visitarmontserrat-lany-2017-un-8-8-mes, accessed August 2018.

in each of the disciplines concerned. Thus, in a fairly general way, and as Habert and Ouadi point out, the inventory of the Zat Valley was built by defining study areas (transects) distributed among researchers and doctoral candidates and it was carried out in two main phases (Patel *et al.* 2003): data acquisition: bibliography and field surveys with GPS points and photographs, and the creation of thematic files. Following the surveys, each team analyzed the results, put them in context and validated them, and then the scientific information collected was integrated into a GIS. Joan Poch, Antonio Teixell, David Gómez-Gras, F.J. Martínez, Esteve Cardellach and José Luis Briansó summarize the main results of their field work, which focused mainly, according to the Brilha method (Brilha 2016), on geological mapping, identification and the subsequent selection of 13 geosites of scientific, educational and tourist interest that represent a major part of the geological history of the Zat Valley.

In the context of this collective work, which does not deal exclusively with the Zat Valley, I will not mention these inventory results any further, which are presented in their chapter. Instead, I would prefer to stress the interest of the comparative approach they have adopted. Indeed, based on the principle that it is essential, in the application file to obtain the UGG label, to clearly identify the distinctive elements of other geoparks, particularly neighboring ones, these authors carried out a bibliographic study to determine the characteristics of the study area in relation to the country's geopark alone (M'Goun's UGG) and two other territories that aspire to become geoparks, Doukkala-Abda and Tazenakht. They then used a hybrid method (qualitative–quantitative) adapted from Brilha (2016, 2018), in collaboration with local experts in natural sciences and tourism. Finally, they took into account, in their selection of geosites of tourist interest, the results of sediment analyses of the most frequented areas in order to detect the presence of signs of environmental contamination likely to reveal the fragility of these areas.

This methodology could therefore easily be used for a possible development of a geopark project in comparable rural areas. However, in the context of a geopark whose main objective is to enhance the value of a territory, while the inventory of geosites is essential, it is not sufficient and it is also necessary to promote methods for analyzing and reading landscapes. The contributions of Martí Boada Juncà, Roser Maneja Zaragoza, Jaume Marlès Magre, Joseph Antoni Pujantell Albós, Sònia Sánchez-Mateo and Carles Barriocanal Lozano are relevant in this regard. These authors first present the most common methodologies, such as Geosystem Territory and Landscape, diachronic image comparison, land use and land cover change analysis used in particular in the International Geosphere-Biosphere Program (IGBP) for its importance as a central element in the global change process, and finally the graphic representation of landscapes with sketches, cross-sections, diagrams and transects. They renew these approaches by proposing a methodology based on the interpretation of landscapes from the integrative perspective of

socioecological systems that are the result of constant interactions between biophysical and socioeconomic elements.

The use of this methodology is particularly interesting because, by aiming to improve the understanding and enhancement of landscapes in a systematic and interdisciplinary perspective, it can be mobilized as a useful holistic tool for environmental education and science communication. Finally, it is illustrated by an example of a study carried out in the Zat Valley (High Atlas, Morocco). This method can also be complemented by other landscape reading approaches such as the one proposed by Francisco Valdez, Americanist archaeologist, who carried out a 45-day immersion mission in the Mixteca Alta UGG, Oaxaca (Sierra Madre Del Sur physiographic province, Mexico). He reveals the path he has gradually followed to raise awareness of this territory's heritage (see Chapter 2 of this book, by Gonzalez Tejada and Girault) by first of all making a sensitive description of this landscape, which includes four main deposits and geological formations that are clearly distinguished by their colors and textures. He then turned his attention to the traces of agricultural activities carried out in a particularly hostile environment (construction of terraces and irrigation ditches, stone walls on the slopes of the ravines that retain the transported materials, etc.), almost abandoned villages that are nevertheless surrounded by important archaeological sites, and traces of colonial architecture (churches and houses); witnesses of a richer past. Finally, he focuses on the populations by presenting elements of their intangible heritage (crafts, popular festivals, use of indigenous agricultural seeds), as well as their expectations and fears regarding this geopark's project. This multidisciplinary presentation highlights the importance of taking into account heritage elements that can contribute to the development of geotourism within the meaning of the Arouca definition, which emphasizes the identity of the territory by combining all aspects of this territory (Gonzalez Tejada *et al.* 2017, p. 12). Finally, many geoparks have archaeological sites on their territory that must be developed while ensuring their protection. Gwenola Graff, Maxence Bailly, Abdelhadi Ewague and Martin Loyer present the work of a multidisciplinary team that has contributed, in four years, to the knowledge, study and protection of the Azrou Iklane slab site (southwest Morocco). The methodology chosen seems to us to be particularly relevant, particularly in the context of work carried out within a UGG or territories seeking to obtain this label, because it combines the approaches and contributions of three disciplines in the human and social sciences (archaeology, geography and ethnology). This complementarity has made it possible to identify certain aspects of pre-Saharan rock art, including, with the assistance of an ethnologist, the most recent phases of its use in which archaeology usually pays little attention. As a World Heritage nomination was submitted in July 2016 by the Permanent Delegation of the Kingdom of Morocco to UNESCO, the authors of this study also carried out a delimitation and a topographical survey of the area to be conserved.

In this research program, we also had to propose inventory methodologies that could be used in various contexts for the creation of geoparks which, within the framework of a *bottom-up* approach favored by UNESCO, should, if possible, involve local populations in the inventory and management of the heritage of their territory. As Catalina Gonzalez Tejada and Yves Girault have pointed out in this book, taking into account the diversity of representations, which can lead to a kind of “revelation” concerning the relationship to the environment, makes it possible, according to Mayrand (2004, 2007), to identify two stages of evolution: the patrimonial stage (internal reflection/awareness/reconnection) and the stage of the creation of the mental territory (consolidation/exteriorization/sharing). De Varine (2017) presents many examples of ecomuseums that have succeeded in achieving this first stage of building a narrative of territory with local populations.

In different contexts, other authors are setting up participatory inventory practices (Arpin *et al.* 2016; Bagnolini 2016; Legrand *et al.* 2017) which are increasingly developing within the broader framework of participatory sciences¹⁷ such as the Vigie nature programs or the “65 million observers” carried out by the National Museum of Natural History of Paris, France. It should also be noted that a new Vigie-Terre program has been created which, in partnership with the *Société géologique de France* (author’s translation: Geological Society of France), will be open to all voluntary observers who will thus participate in increasing knowledge on geodiversity and safeguarding it in the face of urbanization and civil engineering works¹⁸.

For various reasons, which focused both on the epistemological specificities of each of the disciplines encountered and on the misunderstandings or critical positions that the various researchers in the program had on these participatory inventory approaches, they could not really be put in place. Wishing, however, to open the “heritage channel” (Heinich 2012, p. 41) to the inhabitants of the Zat Valley so that they can become “fabricators”¹⁹ of the heritage of a hypothetical

17 See, for example, the *Sciences participatives biodiversité* networks for France: www.naturefrance.fr/sciences-participatives/le-collectif-national-sciences-participatives-biodiversite/; and for Europe: <https://ecsa.citizen-science.net/>; land for the world: <http://citizen-science.org/>.

18 For more information on this subject, see www.geosoc.fr/actualites-sgf/1591-qu-est-ce-que-vigie-terre.html.

19 The idea of “heritage fabricators” makes reference to how researchers are implicated and participate in patrimonialization processes. From a seminar and collective work of UMR 208 PALOC MNHN/IRD, the laboratory in which this research comes from is part, is involved in this research. This term does not refer exclusively to researchers but also to other actors in the heritage management field, like policy makers or administrative representatives of national and international institutions, economic actors and local communities, all part of the ideal co-construction of the territory.

future geopark that could be created (if they so wished) on the territory of the Zat Valley, a geographical information system (GIS) has been developed by Élisabeth Habert and Ali Aouda – not to draw up a catalogue of species and so that knowledge can be safeguarded, but in the spirit of transmitting these objects to local populations so that they can appropriate them and, according to their wishes, set the limits of the territory of a future geopark and co-construct its story²⁰.

1.5. Geotourism and education

A territory that wishes to obtain the UGG label must offer varied geotourism (georoutes, education trails, museums, etc.), some of which must already exist when the application is submitted. Given the rapid increase in the number of smartphone users and the access to communication technologies that has become increasingly available over the past two decades to all categories of society, many geopark managers are highlighting their territory on virtual websites and/or museums.

Élisabeth Habert and Ali Aouda, after presenting the related bibliography, propose two examples of the creation of a virtual museum (Kanellos and Daniilia 2009) in geoparks (UGG Troode in Cyprus and UGG Beaujolais in France). They then present the methodology they have chosen for the implementation of a territory narrative, also called a *story map*, which, according to them, is defined in a specific context and with the objective of developing a cartographic scenario²¹. Their positioning underlines the importance of taking into account both the construction/production of the card object and the “consumption” as well as the use of the product result before choosing the software that will build this scenario. They conclude their article by specifying that spatialized narration seems to them to be adapted to the enhancement of natural heritage insofar as it is exposed to the public, while being protected in order to guarantee its management and sustainability. The virtual museum therefore allows visitors to identify the heritage sites and objects in a geopark’s territory, and at the same time, it refers the reader to awareness-raising articles on the importance of heritage preservation as a memory of the people, the Earth and the biodiversity of the region.

Aurélié Zwang, by comparing the graphic materiality of the scriptural documents of the websites of four French geoparks (Lubéron, des Baux, du Chablais and des Monts d’Ardèche), analyzes their communicative intentionality in terms of environmental education in the territory. Her work does not focus on the analysis of

20 The GIS data have been uploaded to the EUDAT platform: <https://b2share.eudat.eu/>.

21 Link to the virtual museum: www.arcgis.com/apps/MapSeries/index.html?appid=4b048be0293b4e0d9778785c8a7b488d.

what is being implemented in education for school audiences²² (i.e. the respective “educational territories” of the geoparks studied), but on the “educational maps” as they are, respectively, presented (i.e. on what is being constructed and shown in the context of environmental education for school audiences). Through a meticulous semiotic analysis, it reveals a tension “between the demonstration of territoriality as the embodiment of an educational specificity” and an “adherence to the epistemological, axiological and praxeological frameworks of National Education”. In the context of territories that are in part hyper-patrimonialized (geopark, regional natural park, geological reserve, biosphere reserve), her research, while stressing that according to the various labels there is no specificity in environmental and/or territorial education programs, allows her to show that “it is less the heritage that penetrates than it is the school that extends into the local space by an exemplification”.

Under a completely different aspect of mediation carried out within geoparks, and based on a national recommendation stating that “the external design of a geopark museum in China must both fully represent the meaning of the geopark and be in harmony with the building environment”, while also respecting the principles of cost economy and versatility, Yi Du and Yves Girault wanted to analyze the architectural choices of Chinese geopark museums and their consequences in terms of mediation. These authors highlight, in their study of very different geopark museums (Taishan Sacred Mountain UGG Museum, Fangshan Museums which received a *best practice* award for scientific communication, Dali Mont Gangshan UGG Museum which received the *best practice* award for the integration of intangible heritage), that these museums represent three major trends in the architecture of geoparks museums. One emphasizing respect for the “spirit of place” refers to traditional Chinese architecture that values Confucian nationalist values. The second, following the desire of the sponsors to promote the construction of a “city museum” that should contribute to building a positive image of the park and the territory to promote economic development *through* tourism, favors inclusion in the international movement of “supermodernism”. This observation underlines that in the choice of architectural styles for geopark museums in China, there is not simply respect for issues such as those presented in the national guidelines, but rather a hybridization of cultures (defense of cultural identity/opening to globalized culture) that takes place among architects, local elected officials, evaluators from ministries and the GGN. This is particularly explicit in the third architectural trend which, by combining the styles of national tradition and modernism, has gradually evolved into a vernacular version. Finally, this analysis underlines that the architectural project of geoparks is much more retained in terms of an “image project” than in terms of cultural mediation.

22 Aurélie Zwang has analyzed in another article the relationship between technological and pedagogical innovations in ESD, education for sustainable development (Zwang 2019).

I.6. References

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