

## Sustainability Management of Unesco Global Geoparks

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**Abstract.** UNESCO global geoparks dynamic initiative draws attention of both experts and public by its innovatively holistic approach to conservation, presentation and interpretation of the Earth heritage interrelating the geodiversity of the region with its biodiversity and cultural diversity. The objective of this contribution is to analyse the processes behind the sustainability management of the UNESCO global geoparks. The process analysis of the certification and revalidation schemes of the UNESCO global geoparks reveals a combined application of the interrelated approaches of the sustainability management, in particular the environmental quality management, knowledge management, strategic management and participative management. The environmental quality management, stimulating UNESCO global geoparks to implement their mission, is ensured through the system of initial certification and regular revalidations. The performance of the UNESCO global geoparks is coordinated on the continental and global levels. This networking facilitates an effective implementation of the knowledge management, which consists in the systematic sharing of knowledge and experience among individual geopark representatives. The participative management is implemented not only through the participation of the individual geoparks representatives in the decision making processes of the Global Geoparks Network and continental networks, but mainly through the participation of local actors in the activities of given UNESCO global geopark. The application of the strategic management ensures the long term balanced contribution of UNESCO global geoparks to the sustainable development and cultural identity of the given region. The analysis has shown a specific way in which the selected concepts of the sustainability management are implemented in the evaluation and revalidation procedures, networking and other pillars of the UNESCO global geoparks development.

**Subject Classification Numbers (JEL):** L83, Z32.

### Introduction

The increasing interest in and responsibility of ordinary people for the nature and landscape they live in has not only led to the rise of bottom-up environmental initiatives but also to their support by national, transnational and international institutions. This "paradigmatic" turn in nature protection has also led to the emergence and dynamic development of the UNESCO Global Geoparks (UGGs) initiative. It is a holistic concept of protection [1], the presentation, interpretation and sustainable use of geoheritage and other natural and cultural heritage, based on the activity of local actors. It is also a quality label, awarded and systematically controlled by UNESCO.

Geotourism [2 - 4] as a relatively new form of tourism has been developing since its origin in accordance with the principles of tourism sustainability [4 - 7]. The holistic concept of linking conservation and the presentation of geological, other natural and cultural heritage is reflected in the planned Earth Heritage interpretation [8], e.g. in the form of the ABC concept (Abiotic, Biotic, Cultural – [4]). According to Pásková ([9]), the basic principle of geoparks is the implementation of a participative approach to their management, which takes place at several geographic levels. A major impetus for the holistic sustainability of geopark development is the emphasis on integrated quality management. It has become progressively enriched into the form of sustainability management, a key feature of the development of global geoparks by UNESCO, which is reflected in their certification and revalidation schemes as well as in Global Geoparks Network (GGN) statutes [9, 10].

In the context of recent trends in UGGs' development, this study analyses the application of selected concepts of sustainability management within UGGs' certification and networking processes.

### **Theoretical Backgrounds**

This study is theoretically based on the current concepts of sustainability management, including approaches as environmental quality management, participative management, strategic management and knowledge management. The last mentioned approach is closely connected with the adaptive co-management [11].

### **Sustainability Management**

Sustainability management has developed since the 1980s, especially for business environments and later by organizations in general. Initially, it was based on managing their internal processes in order to reduce their environmental impacts, for example, by applying cleaner production methods [12]. Gradually, formal and certified environmental management systems ("EMS") have developed, in addition to national standards, in particular according to ISO 14000 or EMAS [12]. These certified systems, in their gradual development, have also significantly involved the company's surroundings – inputs of the company, including its suppliers, the company's clients, and the creation of supply and demand chains of companies with established EMS management. In addition to formal approaches, an informal approach, referred to as Total Environmental Quality Management (TEQM, e.g. [13]), has been developed as a follow-up to Total Quality Management (TQM).

However, as Starik and Kanashiro [14] analyse, the current management theory of the organization does not take sufficient account of the dynamically changing external environment of the company and lacks the consistent link between the organization's management and its environmental and socio-cultural environment. They critically assess predominant focus on short-term sustainability at the expense of long-term goals and activities, excessive management anthropocentrism, including interpreting the importance of the organization's surroundings as "resources." Hörisch, Freeman and Schaltegger [15], in addition to Starik and Kanashiro [14], also consider part of the approaches to social responsibility implementation, especially the compensation approach (e.g. [12]) and the inconsistent inclusion of interest groups and stakeholders into the management of the organization.

In order to improve the quality of sustainability management, Starik and Kanashiro [14] propose their "prototheory" of organizational sustainability management, based on a consistent system and process approach involving organizations, societies and individuals and the environment ([14]: 18). Their approach is supplemented by Hörisch, Freeman and Schaltegger [15] with the emphasis on the development of interest group theory based on the approaches that create common interests stemming from mutual cooperation on sustainability as a shared value among all interest groups. The development of this cooperation is conditioned by education, the creation of values and regulation ([15]: 338-340; [16]). In this form, sustainability management represents a synergic combination of concepts of environmental quality management [12, 13], participative management [17], strategic management [18] and knowledge management [19].

### **Sustainability Management Component Concepts**

Environmental quality management focuses on reducing resource consumption, emissions and waste (e.g. [20]) and biodiversity protection [21]. In particular, it uses preventive approaches, continuous improvement processes in the organization, the creation of environmental quality networks and a multilevel audit system. The participative management uses the positive benefits of collaborating with the greater potential of know-how, shared values, motivation to promote common goals (e.g. [17]), including sustainable development goals and respect for the specific interests of participating organizations. Development sustainability of as well as the reaction time of

the biosphere and geosphere to the acting impacts must be based on a long-term strategy and strategic management (e.g. [22, 23]). Knowledge management, links and generates out of available knowledge, information and data the new knowledge, which is provided, to the adequate extent, form and structure, to the management body, employees and other interest groups (e.g. [24]). It can be considered as a dynamic factor in the development of sustainability management of organizations (e.g. [25, 26]) and the basis for the effective application of other management methods and approaches.

This enrichment of the organization's sustainability management theory can be well applied in the sustainability management of locations and regions due to its holistic approach and interconnection to the environment. This relatively new theoretical concept is gradually applied to the management of organizations whose mission significantly exceeds the needs of their governing bodies as well as time and place of their action. This type of organization also includes UGGs, whose way of sustainability management is the subject of this study.

### **Methodical Approach**

The aim of this study is uncover the specifics and processes behind the UGGs' management, which make their performance effective and sustainable (economically long-term viable, socio-culturally well accepted and environmentally responsible). In the frame of explanatory process analysis (e.g. applied for the Tourism Master Plan development in Australia's Northern Territory [27]), the separated component steps, consequent stages and whole algorithms of the UGGs' certification scheme as well as their decision making bodies and application of key sustainability management concepts in their operation were identified. The analyses of the procedures of the initial evaluation and periodic revalidation system as well as the multilevel networking apparatus were carried out. These analyses and related data collection were based on the study of the UGGs' statutes and operational guidelines, website, available application and revalidation documents of aspiring and revalidated geoparks, as well as on the European Geopark Network (EGN) and Global Geopark Network (GGN) statutes [10], annual reports and websites. An important input in this study was a personal experience of one of authors who serves as a UNESCO global geoparks evaluator, member of UNESCO Global Geoparks Council, GGN Advisory Committee, EGN Coordination Committee and both Management Board and Scientific Committee of one of UNESCO global geoparks. All the key components and phases of the UGGs' management (planning, organizing, leading, controlling) were processually analysed to discover in which way the individual concepts of the sustainability management (strategic management, knowledge management, environmental quality management, and participative management, e.g. [28, 29]) were applied. At the beginning of the process analysis, the key processes of the UGGs' management sustainability were identified: evaluation, revalidation and networking. For each individual process, the key actors, stages, steps and activities, inputs and outputs, tasks and relationships as well as initiator events and finish signals were identified. The recognized key actors comprise e.g. aspiring or revalidated geoparks and their strategic partners, UNESCO member states, desktop and on-site evaluators, UGG Council, UNESCO, IUCN and IUGS. The stages, steps and activities of analysed processes included e.g. sending the application or revalidation document, evaluators' mission, decision/report of UGG Council and decision endorsement by the UNESCO Executive Board. The most important inputs and outputs represent various reports (e.g. annual report, progress report, and revalidation report), contribution to UGGs' visibility (e.g. GGN Newsletter, GGN website, GGN conference, continental networking and workshops). The crucial tasks consist before all in the continuous management of aspiring and revalidated geoparks and related reporting which include e.g. geoheritage conservation, research, education, communication, local sustainable development enhancement (mainly in the form of geotourism). The other important tasks are represented by the networks' management on the national, continental and global level and related relationships. The identified initiator events comprise e.g. visiting of the conference organized on the national, continental or global level, contacting the responsible body of the given member state, GGN membership initiation or sending the revalidation report. Among the typical finish signals belong

the awarding or prolonging the UGG certificate. The key research questions framing the process analyses are displayed in the Box 1.

**Box 1.** Research questions.

- How have UGGs been developed organizationally, institutionally and collaboratively?
- In which way do UGGs perceive their roles in the sustainable development of the region, including the geotourism sustainable development?
- In which way do UGGs promote conservation of geoheritage and related landscape and develop interpretation of this Earth heritage?
- In which way do UGGs develop certification procedures?
- To which extend and in which way do UGGs apply strategic management in their development and operation?
- To which extend and in which way participative management is developed and used by UGGs in their development and operation?
- To which extend and in which way do UGGs develop environmental quality management in their development and operation?
- To which extend and in which way do UGGs apply knowledge management in their development and operation?

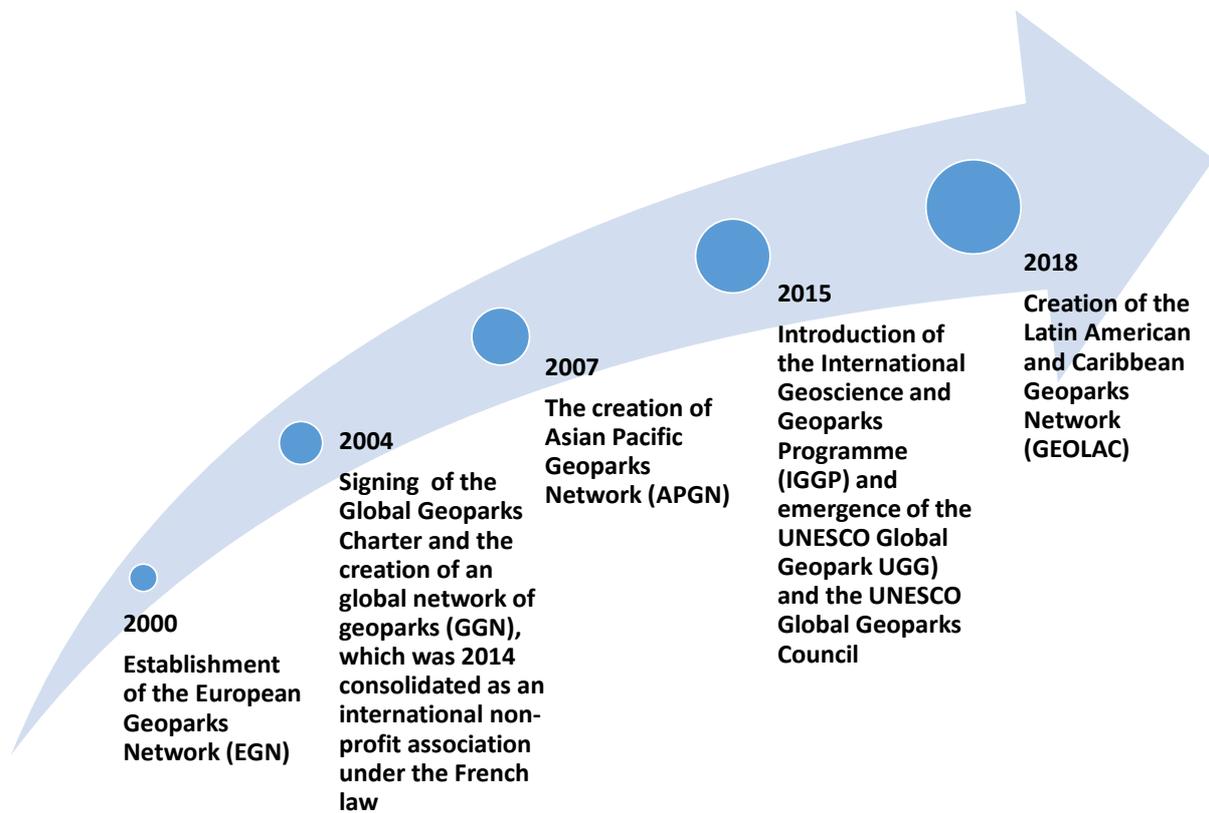
The results are, except of the processual description of identified algorithms of certification procedures and concrete ways of applications of the key sustainability management concepts, depicted in the form of schemes, boxes, and diagrams and summarized in the table.

## Results

### Trends in the geoparks development

Pásková [30] defines the geopark as “*one of the ways to protect and, at the same time, to use Earth's geological heritage in a rational and responsible way. She emphasizes that despite the fact that the emergence and development of geoparks is supported at national, continental and global levels, and its quality is controlled by UNESCO for global geoparks, it is a bottom up initiative initiated and coordinated by local actors. She sees the geopark as "a territory where there is a social consensus on how to live in harmony with nature to preserve the activity of man in the landscape and to cultivate its natural and cultural values"*. Geoparks as a clearly defined territory with their own active sustainability management are a major factor in the development of geotourism.

Organizational and institutional development of geoparks took place in the world since 2000 in the form of networking at national, continental and global level (e.g. [6, 31]). An important milestone of this development was the year of 2015, when the UNESCO general conference approved the new "UNESCO Global Geoparks" brand as part of the International Geosciences and Geoparks Program (IGGP). This consequently led to the changes in the processes of the initial evaluation and subsequent revalidation system of original global geopark (just supported by UNESCO). Collaboration across networks at different geographic levels and in different forms is an important dimension of geopark management (e.g. [6, 32]). The key moments in the development of the geopark initiative are outlined in Figure 1.



**Figure 1.** The key milestones of the UNESCO global geoparks development. Resources: [33, 34] and own processing.

Interpretation of UGGs' territorial values has expanded from the interpretation of geological heritage to the interpretation of interconnection of all three components of the Earth's heritage (abiotic, biotic and cultural). This ABC concept ([4, 7, 30]) highlights the interdependence of geodiversity and biodiversity (e.g. [35]) with the sociocultural development of the local community (e.g. [9, 36, 37]).

Geological values of UGGs' territories are assessed qualitatively by the description of its geodiversity [1] and quantitatively, by pointing the value of geoheritage through the identification of the values of individual geosites (e.g. [38–43]).

UGGs also include knowledge management approaches, whether it is the exchange of experience and knowledge in the frame of networking (e.g. [6, 13]), or geopark collaboration with the local community (e.g. [44]), the education of local residents and visitors [16, 45, 46] and the way of interpretation of geological, biological and cultural heritage. The exchange of experience and knowledge takes place mainly within the framework of EGN and GGN thematic working groups, workshops and conferences, in the form of a GGN competition concerning examples of good practice held at two-yearly intervals. Knowledge management is mainly used in the assessment process of aspiring and revalidated geoparks, when the evaluators hand over to geopark representatives their experience and knowledge, concerning geopark management, to the conservation, presentation and interpretation of geoheritage, to geotourism development and to the involvement of the local community in geopark activities. The evaluators themselves have regular workshops organized by UNESCO, where, in addition to new information from UNESCO and feedback from the evaluated geoparks, there is a mutual exchange of information and experience between evaluators and their feedback to UNESCO.

The emphasis is on the economic and social role of geoparks in the regions in relation to new jobs, new economic activities and types of income [3, 34, 45 - 48], local agricultural and craft production [47] and both traditional and innovative regional production [47]. Geoparks can also

significantly boost local culture ([3, 49]). Many authors emphasize the role of geoparks in sociocultural sustainability in the region and the importance of the role of indigenous peoples [9, 37, 50–52], as well as the involvement of local and indigenous people, their knowledge and experience in the management, operation and activities of the geopark within different bodies (consultative bodies, general assemblies), workshops, conferences, competitions, strategic partnerships, training courses, or geoguide services. This represents an effective combination of participative and knowledge management. The considerable role play geoparks in the geoheritage conservation in cooperation with the local community [44, 45] as well as in the other natural heritage (mainly biodiversity) conservation [29].

### Trends in geotourism development

Geotourism is one of many environmental and socially responsible innovations in the effort to implement the principles of sustainable tourism. The philosophy of tourism sustainability began to attract attention and real contours only after the Earth Summit (1992), which brought a clear understanding and declaration that tourism also has significant negative impacts on the natural and socio-cultural environment of destinations [7, 53], negative impacts on global level, mainly connected with the transport of visitors to destinations. The key outcome of this summit was the creation of a global Agenda 21 for tourism (UN WTO), with its gradual development into local Agendas 21 for tourism (e.g. [54]). Among the most important approaches of tourism sustainability are the integrated management (e.g. [55]), systematic and system management of the destination (e.g. [56, 57]) and participative management for involving key tourism stakeholders living inside and outside of the destination [15]. The specifics of application of participative management in tourism were elaborated already in the beginning of the third millennium in Australia [58] and further developed (e.g. for tourism in protected areas [59]). To control tourism sustainability, it is also important to optimize its impacts, which is to reach a compromise situation in which its positive effects are maximized while minimizing the negative ones ([7, 53]). For that reason, in addition to the aforementioned participative management and strategic management, monitoring of tourism impacts is implemented, which is a helpful instrument for determining the carrying capacity of the destination and its life cycle [7]. This represents one of the many forms of the application of the knowledge management concept and knowledge gained facilitates the tourism impacts management (optimization). Among other approaches applied with aim to manage tourism impacts are visitor management ([60, 61], specifically for geotourism [62]), advanced information and communication technologies in management (e.g. [63] in geoheritage management) and the heritage conservation. An example of conservation of material heritage is use of GIS to protect dinosaur traces [64] as an application of the environmental quality management.

Geotourism represent a specific form of sustainable tourism [3, 4, 7, 65, 66], and geoparks' management can be well considered as a specific form of destination management. Geoparks, however, implement a wider scope of activities; geotourism is just one of them and serves primarily as a tool of environmental education and support of cultural identity of the people living in geopark. Destination management, on the other hand, is professionally specialized in tourism management so that the geopark usually cooperates with the destination management organization competent in its territory.

Thomas Hose was one of the first authors to use the term geotourism in 1995: “*The provision of interpretive and service facilities to enable tourists to acquire knowledge and understanding of the geology and geomorphology of a site (including its contribution to the development of the Earth sciences) beyond the level of mere aesthetic appreciation*” ([67]). He later developed it in his dissertation on the interpretation of geoheritage and geomuseums [66]. According to Pásková [66] in a narrower sense, geotourism can be defined as tourism based on an active experience of exploring the Earth heritage within the so-called geosites, i.e. geologically significant and attractive tourist sites, including phenomena that provide information on the development, the ancient life or current formations and processes of the Earth. According to her, those are various outcrops (especially those with fossil soils, interesting minerals, plant and animal fossils or their traces) as

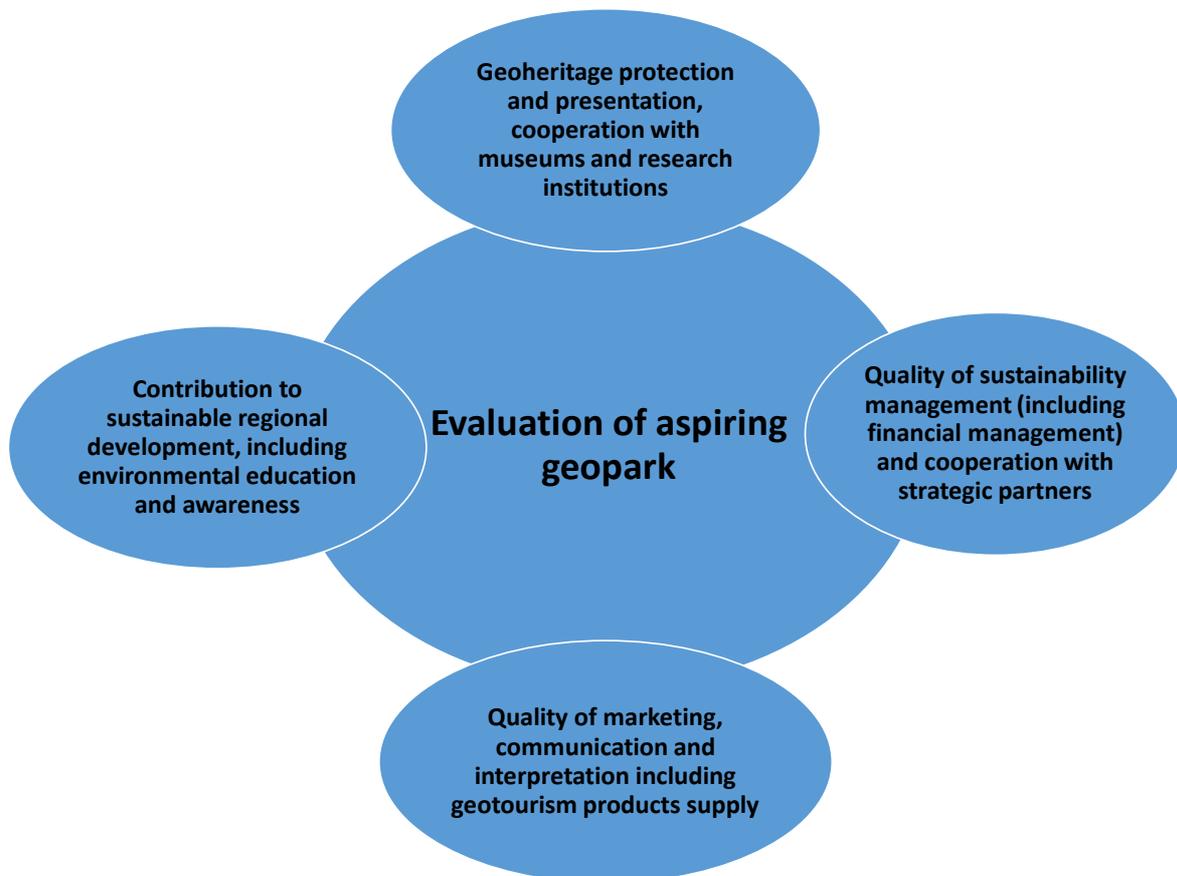
well as remarkable natural phenomena and unique landscapes, including e.g. rock formations, caves, karstic systems, waterfalls, rock windows or towers, abandoned mines and quarries, or thermal springs. The purpose of geotourism activities is to tell the story of how e.g. continent movements, volcanic and glacial activities or climate change have created and still form the present landscape and its unique sceneries. *“Nevertheless, among the geoscientific community, geotourism means the recreational use of the geodiversity, in association with some sort of informal education addressed to the general public. The interpretation of the main geological character of the territory is always the main aim for this type of geotourism”*. ([68]:187). A geographically broader interpretation, coined in 2002 by the Travel Industry Association of America and the National Geographic Traveller ([3]:14), defines geotourism: *“... as tourism that sustains, or enhances, the geographical character of place, such as its culture, environment, heritage, and the well-being of its residents”*. Pásková [68] draws attention to the fact that this geotourism definition includes the aspect of tourism sustainability and perceives “geo” rather from the geography or Earth sciences point of view than narrowly geologically orientated tourism. In her opinion, geotourism is a combination of the geologically and geographically based definitions, because in fact it is a wide-ranging sustainable tourism, offering all kinds of natural and cultural attractions in the landscape, whose interpretation, however, is focused on mutual relations and roots in the geological phenomena and processes of the Earth. This definition approach is shared by Newsome and Dowling who define geotourism as *“A form of natural area tourism that specifically focuses on landscape and geology. It promotes tourism to geosites and the conservation of geo-diversity and an understanding of Earth sciences through appreciation and learning. This is achieved through independent visits to geological features, use of geo-trails and viewpoints, guided tours, geo-activities and patronage of geosite visitor centres”* [70]. It is a specific feature of geotourism interpretation to clarify the links between geological, biological and cultural diversity. Geotourism is characterized by a mastery of popular but correct Earth heritage interpretation and enthralling animation of the geoguide. However, the main actor is the geotourist who discovers this “geo-story” accidentally in his/ her activities, such as climbing, canoeing, canyoning, cycling, horse riding, visiting abandoned mining areas and quarries, geocaching, exploring the cultural history of the landscape within visiting archaeological sites, handicraft workshops, tasting and purchasing local geological products, so-called geofood [69]. The above-described holistic approach to the geotourism definition has been expressed in the so called Arouca declaration [71] which insists that *“geotourism should be defined as tourism which sustains and enhances the identity of a territory, taking into consideration its geology, environment, culture, aesthetics, heritage and the well-being of its residents”*. According to this document, *“Geological tourism is one of the multiple components of geotourism”* [71].

## **Certification procedures of UNESCO Global Geoparks**

### **Evaluation Criteria for the Certification of UNESCO Global Geoparks**

Dynamic development of geotourism and UGGs is conditioned by the involved geologists' erudition, enthusiasm of many individuals, interest of locals and visitors and UNESCO professional support, coordination of GGN and continental networks. The basic rules and criteria for UGGs' certification process, whose essential components are schematically illustrated in Figure 5, are set in the UGGs' Statutes and Operational Guidelines [72]. In accordance with this document, the UGGs' objectives, their relationship to all aspects of sustainability management and their relation to the promotion of regional development are set. In accordance with this document and with the aim of gradual and systematic enhancement of the aforementioned organization's sustainability management [14], the geopark management body, its strategic planning, financial management, the way of participative management application as well as the management of information flows and the use of good practice examples are evaluated (Figure2). The UGGs' self-evaluation process is part of UGGs' knowledge management. In accordance with the concept of participative management (e.g. [15]), an active strategic partnership with the key actors is required, in the frame of certification process. If there are some national categories of protected areas or some UNESCO's

designation on the territory of the geopark, it is necessary to demonstrate the way of co-operation with the relevant administrations and the way of elimination the problems caused by mutual overlapping of identity and visibility.



**Figure 2.** Principal components of the aspiring geopark evaluation.

A necessary condition for the aspiring geopark is not only the international importance of its geoheritage but also the existence of sufficient geotourism potential, based on its attraction for visitors and an adequate degree of its development. In the frame of the geoheritage evaluation and related landscape heritage (e.g. [41, 42]), independent scientific experts (as part of a “UGG Evaluation Team”) assess the numbers of internationally significant geosites, geological periods, and clearly defined rock types evidenced in the geopark area. In the frame of its knowledge management, each UGG has to classify its geosites to distinguish between those having prevalingly interpretative (equipped with trails, interpretation panels or leaflets) or scientific significance as well as those with non-geological (e.g. cultural, agricultural, technical) significance. The UGG has to inventory all these geosites through well maintained and updated both database and map.

As a part of the environmental quality management, cooperation on research and its popularization, legal conservation status and non-legislative bottom-up protection as well as the quality of the presentation and interpretation of Earth heritage are also evaluated. The general nature protection as well as geoheritage conservation in the geopark has to be ensured by the legal protection of key both biotic and abiotic (including geological) elements of nature. In these localities protected according to the zoning system of the given protected area, as well as in the rest of the geopark area, the local inhabitants' education and participation on the geoheritage conservation has to be stimulated [10, 12, 16, 29, 33, 35, 44]. According to the ABC concept, geoheritage conservation has to be approached holistically, which means that except of physical protection of geosites by e.g. fencing and natural pavements, it must be integrated into the nature conservation, monument care and intangible heritage protection. Great emphasis is also put on linking of the interpretation of non-geological heritage (both tangible and intangible – e.g. local toponyms in Crete [73]) with the local geological heritage. This evaluation process demonstrates the

key mission of a geopark at the interpretative level (geoscience knowledge management) and presentation (animation mastery). Furthermore, the importance of cooperation with strategic partners (e.g. local accommodation facilities, travel agencies and geoguides), and other local stakeholders is emphasized as a key component of the participative management. The geotourism developed by aspiring geopark, in collaboration with his strategic partners and local destination management organization, is measured by both quantity and quality of geotourism products, geotourism infrastructure, and geoguides.

The proper selection of geopark's territory within which its geodiversity as well as its specific features and uniqueness are evaluated according to the UGGs' statutes and operational guidelines [72]. On the basis of a detailed map indicating the boundaries of the aspiring geopark and its key geosites, the suitability of delimiting the territory is evaluated, especially in view of the representativeness and diversity of the local geological, geomorphological and other related landscape processes and phenomena. It is also assessed how much are these geosites able to enhance geoscience popularization and research as well as Earth heritage interpretation in the frame of education or geotourism.

Management quality of the aspiring geopark is evaluated explicitly through its managerial structure, geopark management method, staff size and quality and human resources management in general, technical and financial conditions, strategic management and cooperation, approach to the participative management. However, it could be assessed also implicitly, according to the achieved results (e.g. suitability of geopark territory definition, visibility and identity level, geoheritage conservation efficiency, geotourism quality, marketing efficiency, acceptance by local population, level of stakeholders' involvement, or quality of environmental education). One of the highest valued activities is cooperation inside of geopark community, involving cooperation with other UGGs, the geopark's involvement in activities organized or supported by GGN and continental geoparks networks. This kind of sharing knowledge and experience through networking and mutual exchange is at the core of UGGs' knowledge management (e.g. [33]).

A way of geoheritage interpretation, geopark marketing and visibility are also evaluated as a result of geopark management in accordance with criteria set by the UGGs' Statute and Operational Guidelines ([72]). The accuracy, the extent and the way of using the UGG's logo and the unified design of the revalidated geopark within its PR, the quality and scope of the interpretative publications and infrastructure, the "welcome boards" on the geopark's access roads are evaluated as well. The geopark's website, its promotional activities and materials, regular participation in tourism trade fairs, social media presentations, mobile applications, geopark's image in media, and its reflection by public are among other assessed components of geopark marketing including its visibility. Marketing and, in particular, the promotion of geopark should be carried out in cooperation with strategic partners.

An important theme, based on the concept of tourism sustainability management, the UGGs' statutes and operational guidelines ([72]), and the long-term evolution of the concept of geoparks as traced in literature, as well as discussed at GGN or EGN conferences (e.g. [34]), is a UGGs' contribution to the UN Sustainable Development Goals. It is implemented mainly by the environmental education of local residents, visitors and other actors as well as raising their awareness of the importance of geoheritage conservation. The UGGs' contribution to the sustainable development on the local and regional levels should include cooperation with authorities of municipalities and regions on the UGGs' territories, encouraging responsible tourism based on sharing authentic local life with visitors, support for regional production, especially small farmers and craftsmen, preference for the use of alternative energy sources and cooperation with strategic partners. It must be accompanied by systematic provision of the local informal education in the field of Earth Sciences and related interpretative tools, e.g. interpretation centres, educational publications and games, interactive websites, and mobile applications. All these activities, forming components of UGGs' environmental quality management, must take place with the widest possible cooperation of relevant geopark's strategic partners as museums, schools ("geo-schools"), NGOs or individual collaborators and volunteers ("geo-ambassadors").

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### **The actual process of certification and revalidation of UNESCO global geoparks**

The process of UGG establishment is a typical bottom-up initiative in which geopark manager's activity is backed by experience and advice external bodies (e.g. relevant member states' institutions, or UNESCO) and implemented in the form of gradual well-prepared steps of the certification process coordinated by UNESCO. The process of preparation of geopark establishment takes several years (usually nearly one decade); an aspiring geopark has to function as a de facto global geopark. An important actor in the certification process is the National Geopark Forum / Council (Figure 4), which coordinates the activities of geoparks in the country and facilitates application and revalidation processes of UGGs in their country. This Forum / Council or another competent authority sends UNESCO an official letter on the intention of a particular territory in its country to aspire to obtain the designation of UGGs. The application document is submitted by the management body of the aspiring geopark together with its self-assessment document, both carried out in the prescribed form.

Following the delivery of application dossiers of the aspiring geopark to UNESCO, the evaluation process conducted in the frame of the IGGP begins. The geoscientists selected by IUGS carry out the desktop evaluation and then two independent professional experts selected by UNESCO have to conduct evaluation field mission (one focusing on geosciences and the other on regional development including geotourism). They perform this evaluation mission according to the UGGs' Statute and Operational Guidelines [72], compare their field findings with the self-evaluation of aspiring geopark management and write a comprehensive evaluation report for UNESCO. This procedure is a combination of knowledge management and environmental quality management, which results (evaluation reports) are essential for the voting of the UNESCO Global Geopark Council about the aspiring geopark readiness for the UGG certificate award. This Council consists of twelve voting member with proven relevant knowledge and experience and non-voting members including UNESCO Director-General, GGN President as well as representatives of the IUGS Secretary-General and of the IUCN Director-General. If the UGG Council decides positively, a proposal for the UGG certificate (Figure 5) award is forwarded to the UNESCO Executive Board. After the endorsement by the UNESCO Executive Board, the certificate is granted to the relevant aspiring geopark (an official awarding takes place at the GGN conference) and the management entity is entitled to use the UGG logo (Fig. 3).



**Figure 3.** UNESCO global geopark logo.  
Resource: [74]



**Figure 4.** National Geoparks Council logo.  
Resource: [75].



**Figure 5.** The UGG's certificate.  
Resource: [76].

A common and proven part of the certification schemes is to grant a certificate for a specific period, usually accompanied by a set of recommendations for the next revalidation period. UNESCO, in line with this practice, grants a 4-year UGG certificate (Figure 5), and after that period, UGG's revalidation, including checking compliance with recommendations from previous revalidation, takes place. One of the components of the application of the environmental quality management, incorporated in accordance with the common procedures used in the certification schemes (see e.g. ISO 9001, ISO 14001), is the requirement for the continuous improvement of management. Therefore, revalidation procedure requires proof of progress performed within the revalidation period (since the initial evaluation or the last revalidation) which includes quality improvement of the implementation the strategic management, financial management, and human resources management for another four years. The revalidation process can have a triple result, which used to be illustratively expressed in colour cards for clarity and ease of communication (Box 2).

**Box 2.** Classification of UGGs' revalidation output.

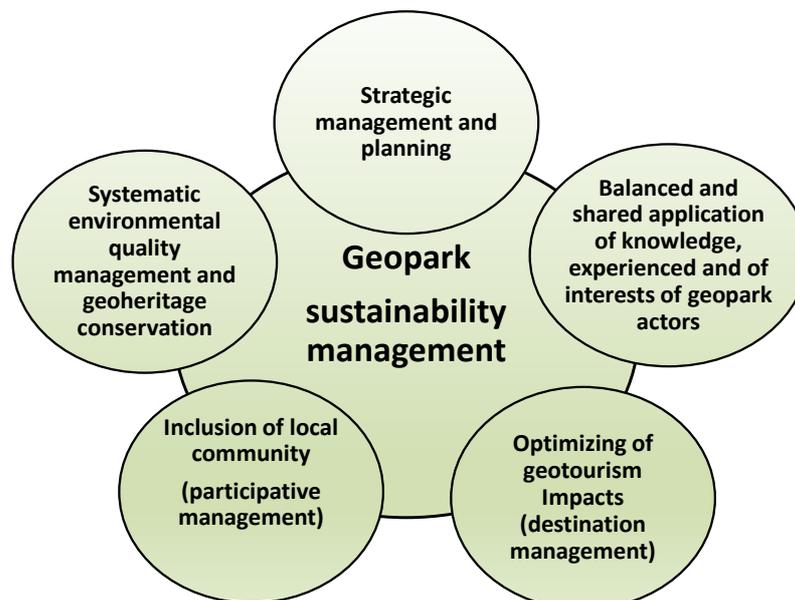
- **“Green card”** means the renewal of the UGG certificate for four years,
- **“Yellow card”** means the renewal of the UGG certificate for two years (significant deficiencies in UGG's activities; UNESCO will invite the geopark managing authority in writing to correct the situation within two years, otherwise the UGG certificate will not be restored, followed by **red card**),
- **"Red card"** means the non-renewal of the UGG certificate and it is only issued if during the previous two-year "yellow card" period the revalidated geopark did not address the insufficiencies determined by UNESCO.

**Discussion**

The results of the process analysis and relevant literature indicate that UGGs' sustainability management is based on the following six principles ([29], substantially modified):

- appropriately selected territory for the presentation of the selected Earth heritage, with a sufficient area allowing support to the regional development and the active involvement of the local population (application of participative management);
- geoheritage conservation for future generations, mainly in the form of voluntary Earth heritage protection supplemented by legal nature conservation (application of environmental management);
- environmental education of the general public including the geoheritage interpretation of the geopark within the ABC concept (application of environmental quality management);
- interacting with other national and international programs (including the mutual co-operation with other UGGs) and sharing knowledge, knowledge and experience between UGGs through multilevel networking (knowledge management application);
- certification system consisting in an initial evaluation and regular revalidation (application of environmental quality management);
- compliance with the sustainable development principles and goals, active cooperation with strategic partners, strategic planning of individual UGGs and whole networks, revalidation action plans and control (application of strategic management and participative management).

The key aspects of sustainability management of UGGs are shown in Figure 6.



**Figure 6.** The key components of the UGGs' sustainable management.

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An overview of how the selected sustainability management concepts are applied in UGGs' certification procedures and networking is provided by Table 1.

The UGGs' organizational and institutional evolution evidenced the significant transition from the voluntary network to the official UNESCO designation in the frame of the IGGP. This transition brought important changes in the involvement and competences of various subjects and institutions as well as to the operational rules and guiding principles. One of the most important changes is the decisive role of UNESCO and the higher intensity of involvement of the UNESCO member states authorities. The performance of GGN, continental networks and individual UGGs became more professional.

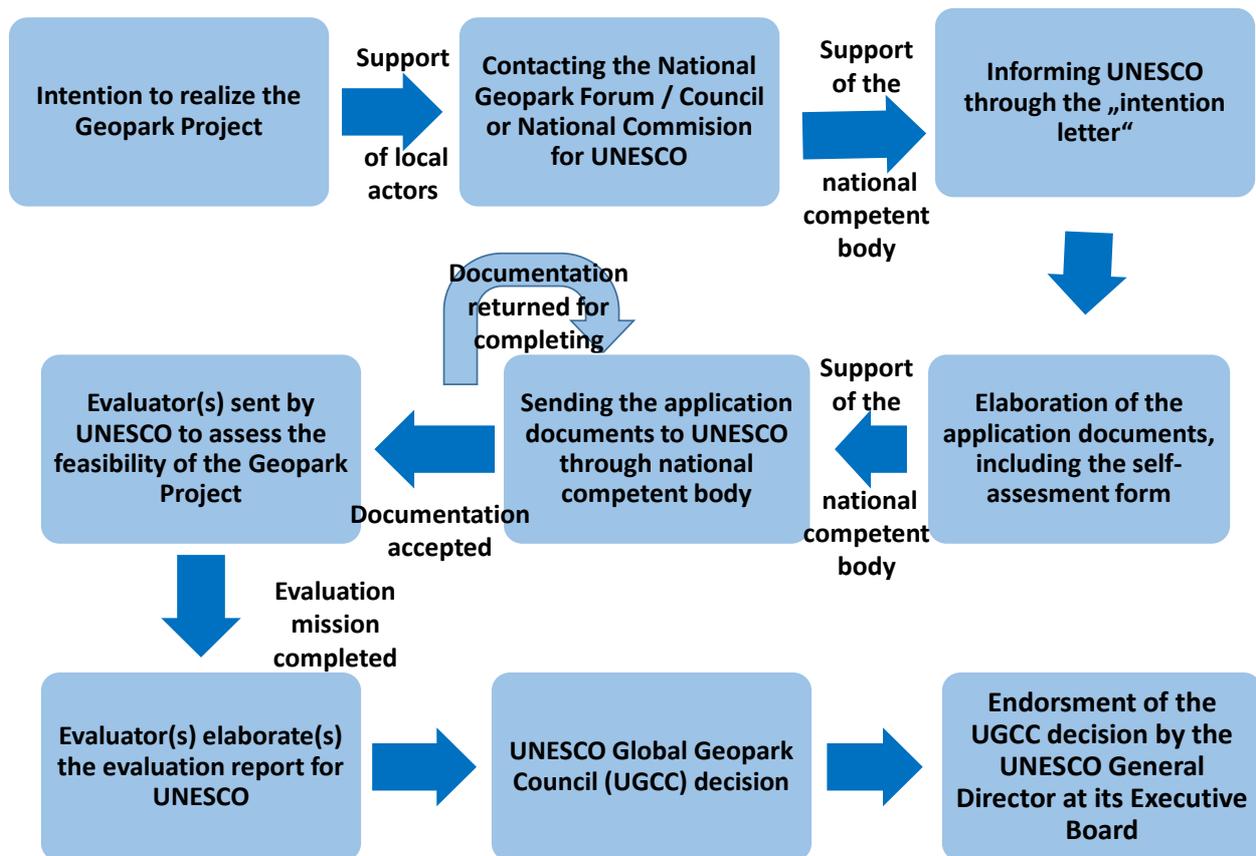
The UGGs' certification scheme as well as the all the UGGs' fundamental documents stress the role of UGGs in the sustainable development of the region. This is implemented mainly by support of geotourism, “geofood”, local farming in general, local / regional production, as well as by development of strategic partnership. This is in some cases accompanied by the certification system developed and implemented by the UGG, when the certificate and logo of “UGG's partners” can be granted to its strategic and other partners on the basis of the selected criteria. The UGG management entity *“should be appropriately equipped to address the entire area and should include all relevant local and regional actors and authorities”* [77]. The management plan should be agreed upon by all the strategic partners, and it should include *“the social and economic needs of the local populations”*, protection of their landscape heritage and support their cultural identity as well as *“the governance, development, communication, protection, infrastructure, finances, and UGGs' partnerships”* [77].

**Table 1.** Application of the selected concepts of the sustainability management to the UNESCO Global Geoparks certification and networking process.

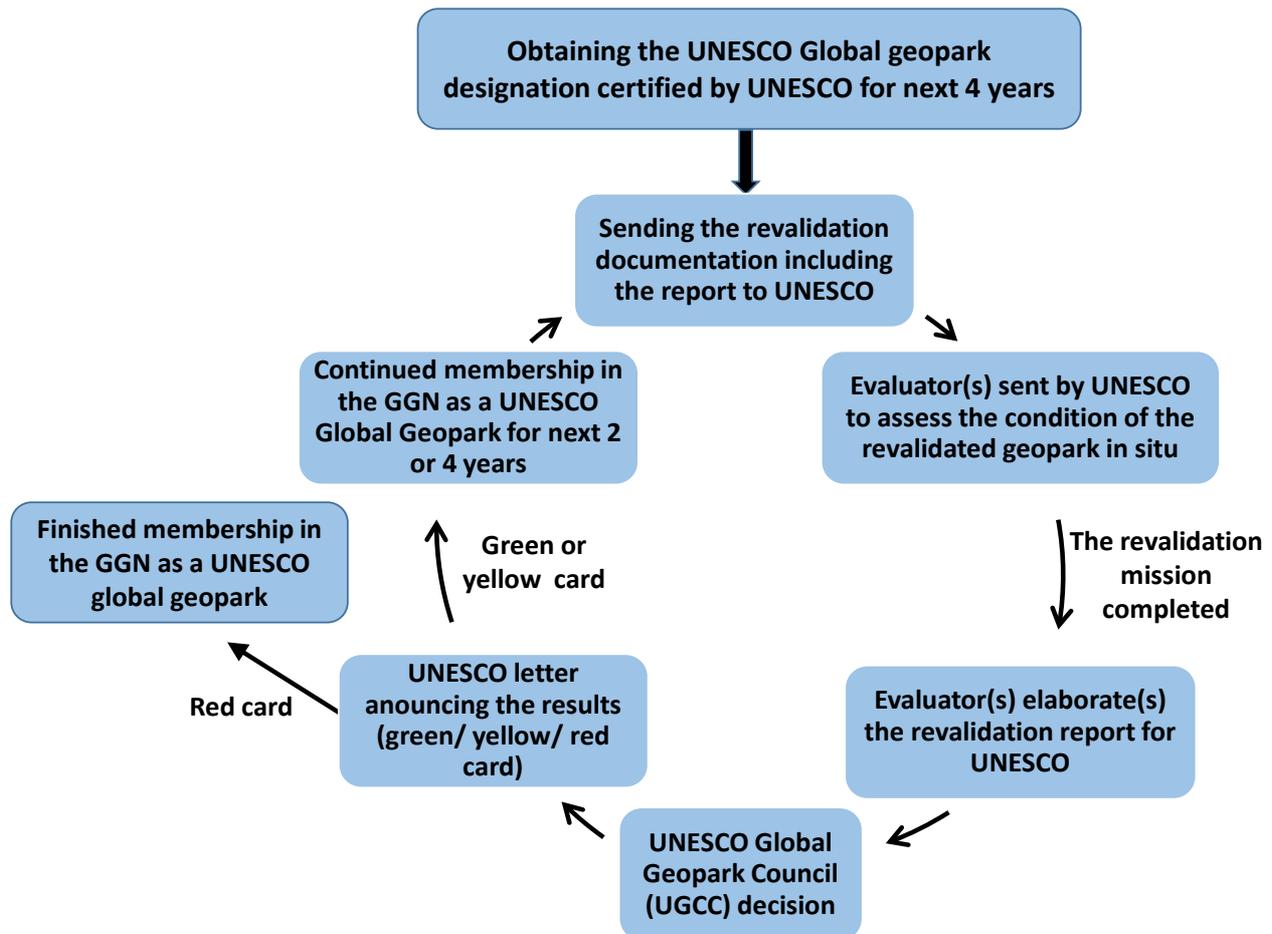
Selected concept of sustainability management	Methods of the concept application in the UNESCO global geoparks (UGGs) sustainability management	Weaknesses, risks, and barriers to the concept application in the UGGs sustainability management
Strategic management	<ul style="list-style-type: none"> <li>• EGN and GGN strategies</li> <li>• UGGs strategic plans</li> <li>• Revalidation action plans and control</li> <li>• Managing authorities of UGGs and continental networks</li> <li>• 10 focal topics of UGGs</li> <li>• Strategic plans of the individual UGGs</li> <li>• Financial planning with 4-year action plans</li> <li>• Mission of UGGs – EGN/GGN Charter and UNESCO Statutes and Guidelines, GGN Statutes</li> <li>• Long-term cooperation with destination management</li> </ul>	<ul style="list-style-type: none"> <li>• time consuming, erudition, project management, fundraising, relationship management, key actors analysis</li> <li>• personnel and organizational changes in local governments, national governments, and management of the key relevant institutions</li> <li>• difficulty in deploying the management of continental networks (unpaid function)</li> </ul>
Participative management	<ul style="list-style-type: none"> <li>• Involvement of all UGGs into General Assembly</li> <li>• Involvement of all European UGGs into the Coordination Commission of EGN</li> <li>• Involvement of the key actors of individual UUGs into their management and activities</li> <li>• Strategic partnership of individual UGGs</li> </ul>	<ul style="list-style-type: none"> <li>• time consuming, delays in decision making</li> <li>• lower predictability of the behaviour of some key actors</li> <li>• distrust and / or reluctance of the local inhabitants and other key actors</li> </ul>
Environmental quality management	<ul style="list-style-type: none"> <li>• Initial evaluation and periodical revalidation of UGGs</li> <li>• Periodic reporting on UGGs progress</li> <li>• Annual reporting of UGGs</li> <li>• Geoheritage management and conservation</li> <li>• Geohazards management</li> <li>• Continuous environmental awareness raising of local residents and visitors</li> <li>• Systematic (ABC) interpretation of the Earth heritage</li> <li>• Regular organization of the EGN geoparks week</li> </ul>	<ul style="list-style-type: none"> <li>• the difficulty in qualifying and financing UGGs</li> <li>• demands on objectivity, qualification, erudition, ethics, and the work of UNESCO evaluators (honorary function)</li> <li>• time consuming and workload of both internal and external members of UGGs</li> </ul>
Knowledge management	<ul style="list-style-type: none"> <li>• Thematic working groups of GGN, EGN and other continental networks (e.g. volcanology, palaeontology)</li> <li>• Biennial GGN conferences and regular conferences of EGN and other continental networks</li> <li>• Capacitation and mentorship system of UGGs</li> <li>• Workshops of UNESCO global geoparks evaluators</li> <li>• Best practice examples awards within GGN</li> <li>• EGN (and other continents') Coordination Committee</li> <li>• GGN Executive Board and General Assembly</li> <li>• GGN, EGN and other continents' Advisory Committees</li> <li>• EGN coordinator and vice coordinator</li> <li>• National geoparks forums and their regular meetings</li> <li>• International Intensive Course "UNESCO Global Geoparks and Geoheritage Management"</li> <li>• Inventory of UGG geosites and their assessment system</li> <li>• UNESCO cooperation with IUGS on geological evaluation</li> <li>• Collaboration of UGGs with scientific institutions</li> <li>• Monitoring of the geotourism impacts</li> <li>• Knowledge systems of local and indigenous people</li> <li>• Mapping and assessment of geological values and risks</li> </ul>	<ul style="list-style-type: none"> <li>• time and finances consuming, demanding language skills</li> <li>• ethical and political sensitivity (exploitation of local and especially indigenous inhabitants' knowledge, violation of the intellectual rights)</li> <li>• demanding on collective memory transmission as well as on participation continuity of the persons involved in the networking and evaluation and revalidation procedures</li> </ul>

UGGs promote, support and implement geoheritage conservation and related landscape not only in the form of own geosites' management, but also in the cooperation with the various voluntary organizations or state nature conservation institutions. The “international value” of the geoheritage of an aspiring geopark is assessed by scientific experts who are members “UGG Evaluation Team” [74]. The Earth heritage in UGGs is interpreted mainly in the frame of geotourism, education, capacitation, and intensive awareness raising. The UGGs' interpretation is specific for its usage of the ABC concept interlinking mutually abiotic, biotic and cultural Earth heritage components.

The UGGs' certification system includes an initial evaluation and periodic revalidation of the implementation of the six aforementioned UGGs' sustainability management principles as well as the quality of their financial management, marketing (visibility management) and their geotourism products. The UGGs' certification is a continuous process (Fig. 7, Fig. 8) and its important part is the preparation for the certification with experience gained in regular meetings, workshops and conferences of continental networks and GGN. At the same time, the certification is a permanent challenge, as the successful revalidation of UGG is conditioned by the development of participative geopark management and marketing, cooperation with research and educational institutions, and support for regional sustainable development, including support for local small farmers, craftsmen and other producers respecting the region's tradition and landscape. Successful revalidation is also a condition for quality progress and widening of environmental awareness, the interpretation of the Earth heritage, with emphasis on the use of modern information technologies (QR codes, virtual guides, or virtual presentations with the animation of geological development of the territory) and geopark geotourism products.



**Figure 7.** Application and evaluation process of the UNESCO Global Geoparks. Resource: [77].



**Figure 8.** Revalidation process of the UNESCO Global Geoparks. Resource: [77].

The UGGs' strategic vision is expressed in the UGGs' statutes and operational guidelines, GGN statutes [10] and EGN / GGN Charter. The UGGs' strategic management plans as well as periodic revalidation planning and controlling represent conducive tools of strategic management for all the UGGs. Not only GGN but also continental networks develop and implement their strategies to plan and systematically control their continual progress. The UGGs managing authorities and continental networks are striving to implement ten focal topics of UGGs outlined by UNESCO. Long-term cooperation with destination management organizations working in the geoparks' territories is another example of the strategic management applied by UGGs.

The participative management is at the core of UGG's philosophy based on the bottom-up and networking approaches. The main UGGs' mission consist in dissemination of the Earth heritage knowledge to the local people through their both direct and indirect involvement into the UGGs' activities. The other key actors of individual UUGs are involved into their management and activities mainly through strategic partnership. The UGGs are certified by UNESCO, but their performance is co-ordinated through networking on the global, continental and national levels. Within the GGN, its institutional (UGGs representatives), individual, honorary and cooperating members are involved into its General Assembly and in similar way, all the European UGGs are involved into the EGN Coordination Commission activities.

The application of environmental quality management seems to be principal mainly in the controlling management component the UNESCO global geoparks. Both initial evaluation and revalidation schemes include control of the progress in the geoheritage protection and management, geohazards management, continuous environmental awareness raising of local residents and visitors, systematic Earth heritage interpretation and annual reporting.

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The UGGs apply knowledge management predominantly through their multilevel networking and certification system. The most applied tools include thematic working groups of both EGN and GGN, biennial both EGN and GGN conferences, regular meetings of the GGN Executive Board, GGN, EGN and other continents' Advisory Committees, EGN Coordination Committee and committees of other continental networks, national geoparks forums and their and workshops of UGGs' evaluators. E.g., the assessment of the geoheritage value of aspiring geoparks “*is based on the international peer-reviewed, published research*” conducted on the geosites and the scientific experts “*make a globally comparative assessment to determine whether the geological sites constitute international value*” [75]. Other useful knowledge management instruments used by UGGs are represented by GGN best practice awards, an International Intensive Course “UNESCO Global Geoparks and Geoheritage Management”, inventory of UGG's geosites and their assessment system as well as monitoring of the geotourism impacts. UNESCO systematically organises or supports capacitation activities (e.g. workshops, seminars, consultations) including the mentorship missions to aspiring geoparks or emerging geoparks networks. Very important is also a systematic cooperation with scientific institutions, discovering and applying the local and indigenous knowledge as well as the mapping and assessment of geological values and risks.

## Conclusions

In the context of sustainability, geotourism can be perceived as an alternative to the mass tourism (e.g. Novelli [78] labelled geotourism as a niche tourism) and geoparks represent areas with managed sustainability. The novelty of this contribution consists in using the sustainability management concept and process analysis method for geoparks' performance assessment. For the future research in this field, it would be helpful to analyse the relationship between activities of the UNESCO global geoparks and international organizations oriented more directly towards the nature conservation or geo-conservation (e.g. ProGEO, IUCN WCPA Geoheritage Specialist Group, IUGS International Commission on Geoheritage). It would be also useful to compare differences in the sustainability performance assessment between individual geoparks and their continental or national networks. A holistic form of the certification system and multi-level UGGs' networking is based on the application of sustainability management, including environmental quality management, participative, strategic and knowledge management (Table 1). This concept benefits from the synergy effects of these concepts, but it also has its own pitfalls requiring patience and openness to innovation. The opportunities and risks of this development, as well as the obstacles and problems associated with the implementation of the different approaches to the sustainability management and their synergies, should be the subject of future interdisciplinary research covering economic, sociology, geography and ecology approaches.

## Conflict of Interest

The authors declare that there is no conflict of interest.

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