Geoheritage

Subjects: Geography, Physical
Contributor: Hara Drinia

“Geoheritage” is a new term that assumes complete perception of Man for nature and the environment. As stated by McBriar “Geological-geomorphological heritage is the collection of geotopes, deposits, forms, and processes that comprise the geological history of each region, and the concept of preserving geological-geomorphological heritage is a cultural concept”.

geoheritage geoconservation geoeducation geotourism geoethics

1. Introduction

In the last few decades and under the UNESCO (United Nations Educational Scientific and Cultural Organization) initiative, there has been an increasing attempt to establish environmental education and its framework in various ways. More precisely, a meeting in Belgrade (Serbia) in 1976, under the auspices of UNESCO, formalized a set of documents known as Charter of Statutes of Belgrade [1], explicitly mentions the need for a significant change in human attitudes by taking more effective action for the global environmental issue through universal effort at school units. As a result of this effort, a strategy has been established that will allow some organizations and individuals to present more systematic content on environmental challenges and how to address them. In this way, a more harmonious balance between environment and human activity could be reached. This has resulted in several environmental programs in schools, with the goal of rationalizing future citizens to assist them in adopting a more positive attitude toward the needs of our planet and our society, after having received appropriate and necessary knowledge of such matters in advance.

It is worth mentioning that UNESCO never gave up on the idea and initiative of the environmental education; in fact, in 1977 [2], in the context of the International Conference in Tbilisi (Georgia), the participants agreed that environmental education should be treated as a distinct scientific field of paramount importance that should be integrated into educational programs rather than being treated as an afterthought.

Along with environmental education, an international effort was launched to establish and protect the geological heritage. In 1972, the Convention on the Protection of the World Cultural and Natural Heritage took place in Paris (France), and some years later, in 1991, the International Declaration on the Rights of the Memory of the Earth took place in Digne (France) [3]. Through these conferences and their declarations, a European initiative for the protection of geoheritage and geoconservation was launched, with the goal of protecting exceptional geological areas that reflect the evolution of biotic and abiotic factors. In 2000, the European Geoparks Network (EGN) was founded to promote a more systematic and collective process of development and, of course, to ensure geodiversity [4]. Following this, in 2004, the Global Geoparks Network was established, which, along with the EGN, aims to promote the concept of geological heritage in the scientific community and the public, as well as to promote sustainable development in areas that host the geoparks [5].

Despite these initiatives to promote and protect the geological heritage, environmental education does not deepen directly into issues related to geoethics, geodiversity, and geoheritage. There is a reasonable need to promote geoeducation, which will deal exclusively with the above concepts and will be the primary tool for the first transmission of knowledge and highlighting the importance of places of intense geological interest, which, in turn, will offer the opportunity of geotourism services [6]. Specifically, geotourism encourages various forms of geoeducation in order to organize geosites to be open for the public and offering educational and recreational activities [7][8].

Finally, the need for a more rational assessment of the geoenvironmental status of our planet, as well as the need for more effective management of issues connected to geoenvironmental conservation, led to the development of a new field of geosciences: Geoethics. The first function of geoethics is to improve the social profile and role of geoscience. Moreover, it contributes to forwarding the sustainable use of natural sources with harmonious operation between human activity and

environment. Consequently, this field can accelerate strategies and methods that will respect geoheritage and its prospective [9].

2. From Geoheritage to Geoeducation, Geoethics and Geotourism

2.1. Geoheritage and Geoconservation

Geoheritage aims to highlight the diversity of our planet to illustrate the importance of the biotic and abiotic factors, which document the historical evolution of the Earth [10]. Furthermore, geoheritage focuses on the important geological elements, such as rocks, minerals, and fossils that interpret the effects of past and present actions, which have shaped landforms and other geomorphological structures [11]. The value of geological heritage is further underlined in report from UNESCO [12], according to which geological heritage is characterized as the whole of the most interesting geological sites (geotopes, geoparks, and geological natural monuments) that deserve to be preserved for scientific, didactic, historical, aesthetic, and cultural reasons. There is also a reference in the European Manifesto on Earth Heritage and Geodiversity [13] that argues that the heritage of Earth interconnects the Earth, its people, and their culture; that is, it forms the cornerstone and foundation of our society.

The link between geological heritage and geodiversity, on the other hand, is quite complicated and encompasses all the elements that contribute to the creation and development of the Earth [14] (**Figure 1**). Geodiversity is a crucial component of the Earth system and is described as the variability of abiotic nature or the abiotic diversity of the surface of the Earth. Geodiversity, along with biodiversity, constitutes the natural diversity of our planet.

Geoconservation is a relatively new scientific field that has emerged in recent decades due to the growing importance of conservation and sustainable use of environmental resources [15].

The concept of “geoconservation” can be defined as an activity or group of actions that contribute to the conservation, rational management, and protection of geological structures that present geodiversity and hence have scientific and educational value [16]. The term “geoconservation” first appeared in the 1990s e.g., [16]: more specifically, Semeniuk [17] and Semeniuk and Semeniuk [18] reported that geoconservation is concerned with the conservation and preservation of the features of Earth for educational, scientific, and hereditary purposes. Etymologically, this term combines conservation specifically with geological features and parameters. The goal of geoconservation is to identify, protect, and manage valuable parts of geodiversity. According to the international literature, geoconservation is a broad field that deals with concerns such as environmental management, geological hazards (geohazards), and sustainable development [19]. Thus, it becomes clear that geoconservation is initially part of geodiversity along with biodiversity, which together constitute the two major environmental components. There is also the preservation of the geoheritage that highlights the geological history of the Earth.

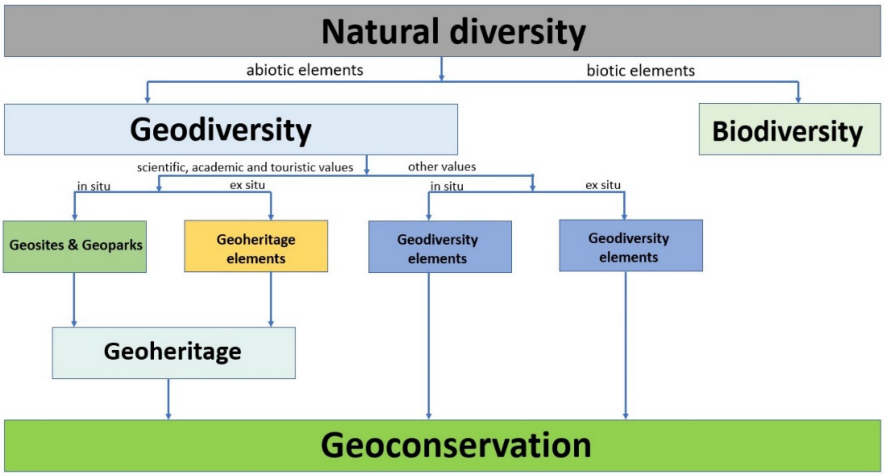

Figure 1. Conceptual framework of geodiversity, geological heritage, and geoconservation. Modified from [20].

2.2. The Need for More Systematic Use of Geoeducation and its Awareness

The traditional educational system cannot highlight the importance and components of geological heritage. As a result, it is vital to make geoeducation more widely available, as well as to integrate it into special curricula programs at various school levels. In this way, there will be a major opportunity for future citizens to be informed about issues that raise geological and cultural interest. It is worth noting here that the European and Global Geopark networks allow the full development of geoeducation, as there is an on-site opportunity for both the public and the scientific community to be informed through educational and cultural activities [21][22]. In addition, the diverse geotopes of geoparks, geosites, and geotrails are valuable tools that may be used by professional geoguides to educate visitors about their importance and impact on the ecosystem.

According to the planning and the agenda of UNESCO [23], education and sustainable development are key objectives for the World Geoparks. Rational information and geoeducation regarding sustainable development can deposit a wide range of uses through geoparks, where the geological and cultural heritage is accentuated. As a result, the immediate goal of a geopark is to assist students who visit them in gaining a better understanding of sustainability and its positive prospects, with the goal of achieving better life conditions for future generations.

Thus, it becomes even clearer that geoeducation constitutes the main tool for transmitting knowledge and, at the same time, emphasizing the importance of geoheritage and geoconservation. Specifically, geoeducation can address the following points: knowledge and awareness of the value of geological monuments; direct experience and understanding of the historical evolution of the planet, and thus the importance of geoheritage reflected in the rocks; and the establishment of natural history museums for the promotion and more systematic identification of areas of intense geological interest and awareness and perception of the geoethical dimension of important geological sites. Furthermore, the aforementioned points, along with the presence of geotopes and geoparks, are appropriate elements for in situ geoeducation both locally and regionally or even internationally. The harmonious coexistence of people with their environment presupposes a thorough understanding of the fundamental of geological processes active in the formation of the planet. This knowledge ensures an attitude for the protection of the environment and strengthens the view of citizens on issues of protection of natural and geological monuments.

It should also be mentioned that the natural history museums that are part of a geopark can widely contribute, with educational activities, special learning programs, outdoor exercises, seminars for teachers and students, organization of conferences and lectures, elaboration and support of research or school programs, cooperation with environmental education centers, creation of interactive educational material, cooperation with global environmental management institutes, and finally, cooperation with universities. In addition, the dissemination of geoeducation can be done in various ways, such as with a series of guided geotrails, knowledge transfer through educational activities organized by qualified teaching staff of each geopark and addressed to schools, and departments of universities and research institutes. In this way, geoeducation can be promoted.

Following that, the transmission and preservation of geoheritage and related concepts can be combined with strategic applications and means that could contribute to the development of the local community.

2.3. The Positive Impact of Geotourism

Geotourism is a relatively new and ever-changing phenomenon. As a result, it is natural that different approaches exist, owing primarily to the geological peculiarities of the areas involved. This means, among other things, that no universally accepted definition of geotourism exists. This could be considered a type of alternative tourism that combines tourism and geology. On the one hand, tourism is a recreational activity based on subjective and aesthetic criteria. Geology, on the other hand, is a science that employs objective criteria. As a result, tourism and geology are two very different disciplines that can coexist and form geotourism, a new emerging type of “environmentally innovative” tourism.

Geotourism is a relatively new form of alternative tourism with significant European and global development potential. It first appeared at the beginning of the 21st century, especially with the appearance and institutionalization of geoparks, which are areas with important geological heritage and rich natural and cultural environments, which, through nature protection and

education, contribute to the development of responsible tourism, strengthening the local economy and sustainable development [24].

To date, many interpretations of the concept of geotourism have been provided. Thus, geotourism is a subset of ecotourism that occurs in areas with significant geological monuments [25][26] and "prioritizes the interactive experience through contact with the geoenvironment and the cultural elements that form the unique identity of each place". In other words, it focuses on the characteristics of the environment of an area with emphasis on landscape and geoenvironment, which includes not only geological elements but also all other elements of cultural and natural heritage, which are closely linked and interdependent with the respective geological environment of a place [27][28].

A key component for the development of geotourism is the understanding of the identity or character of an area. To achieve this, geotourism is based on the idea that the environment consists of abiotic, biotic, and cultural elements (**Figure 2**). This "ABC" approach of Dowling [29] includes the abiotic elements of geology and climate, the biotic elements of animals (fauna) and plants (flora), and the cultural or human components of the past and present. Geotourism argues that, to fully understand and appreciate the environment, we must first know the abiotic elements of geology and climate, as these determine the biotic elements of the animals and plants that live there.

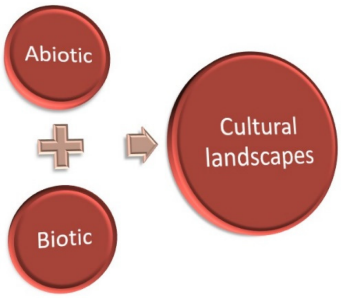

Figure 2. The ABC Approach of Dowling [29].

2.4. Geoethics

Geoethics is an emerging field that examines many aspects of the interactions of geoscientists with society and the environment. It addresses the moral, social, and cultural implications of geoscience research and practice in collaboration with Sociology and Philosophy, providing an opportunity for geologists to recognize their social role and responsibilities in the course of their work. According to Peppoloni and Di Capua [30] "Geological culture and geoethics can strengthen the bonds between people and their land, between their places of origin and their own memories" by recognizing the value of the geological heritage of a region. Education can also convey messages to people about environmental issues and the sustainable use of natural resources, such as the consequences of geological heritage destruction [31]. Geoethics is thus a tool for raising public awareness of issues concerning geopolitical resources and the geoenvironment. An ethical approach must emphasize the importance of nature as a sensual, contemplative, spiritual, religious, and aesthetic experience that is passed down to future generations, rather than just the economic viability of natural resources [32][33][34].

The claim that nature has an intrinsic value that should be protected is often based on spiritual or metaphysical beliefs, but it also stems from human moral considerations and responsibilities to the natural world, as well as the preservation of natural diversity and cultural heritage [35][36][37].

In the expanding field of geoethics, geotourism plays a cultural role. According to Peppoloni and Di Capua [30], geoethics promotes geoeducation through the development of tourism and UNESCO World Geoparks, with the goal of raising awareness, values, and responsibility for geological heritage, particularly among young people.

Consequently, it is understood that this new scientific field constitutes the forerunner for the most effective sustainability and its components (environment, economy, society). Therefore, due to the necessity created by the massive and systematic use

of planet Earth, this new field focuses on the need for a more specialized knowledge of sustainability with the ultimate goal of disseminating knowledge through academia to society (**Figure 3**) [9].

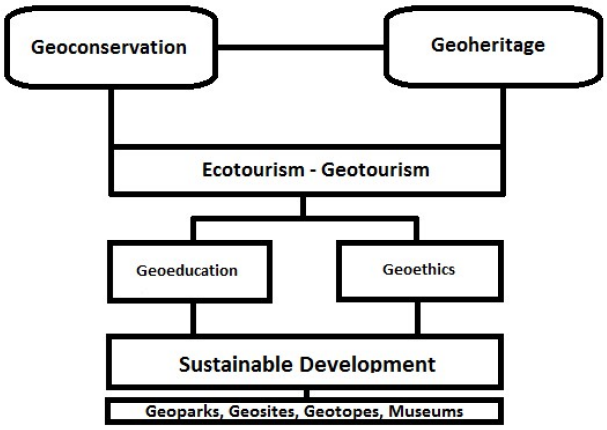

Figure 3. Interconnection and components of rational use between geoconservation and geoheritage.

Geoethics is primarily concerned with the most critical and pressing environmental issues, such as the greenhouse effect, climate change, pollution, and waste management problems. It also aims to promote critical thinking about the use of the natural resources of the earth, the development of environmentally friendly technological methods, and the dissemination of knowledge and information about natural hazards [30]. The incorporation of geoethics into geotourism activities can raise the necessary awareness of sustainability, so that people in a local community perceive the rational use of resources and not take advantage of them. Accordingly, it is fully understood that human society must, in every action, respect the concepts of geodiversity and biodiversity and operate with respect, without negatively affecting any form of mapping of locations and formations that testify to the geohistorical evolution of the Earth and the monuments of geoheritage. Thus, the local community will be able to continue an activity, which will be based on the principles of geoethics and hence future citizens will be able to reap the benefits of the above actions [37] without negative influences or results.

References

1. UNESCO—U.N. Environment program. In Proceedings of the International Workshop on Environmental Education at Belgrade, Belgrade, Yugoslavia, 13–22 October 1975; pp. 1–4.
2. UNESCO. In Proceedings of the Intergovernmental Conference Education, Tbilisi, Georgia, 14–26 October 1977; UNESCO: Paris, France, 1978; pp. 1–96.
3. Martini, G. (Ed.) Actes du Premier Symposium International sur la Protection au Patrimonie Geologique. In Proceedings of the First Symposium on Earth Heritage Conservation, Digne, France, 11–16 June 1991; Memoires de la Societe geologique de France; Société géologique de France: Paris, France, 1993; Numero Special 165; p. 276.
4. Zouros, N. The European Geoparks Network. Episodes 2004, 27, 165–171.
5. Zouros, N.; Martini, G. Introduction to the European Geoparks Network. In Proceedings of the 2nd European Geoparks Network Meeting: Lesvos, Natural History Museum of the Lesvos Petrified Forest, Lesvos, Greece, 3–7 October 2003; Zouros, N., Martini, G., Frey, M.-L., Eds.; pp. 17–21.
6. Farsani, N.D.; Coelho, C.; Costa, C. Geotourism and Geoparks as novel strategies for socio-economic development in rural areas. Int. J. Tour. Res. 2011, 13, 68–81.
7. Dowling, R.; Newsome, D. (Eds.) Geotourism; Elsevier/Heineman: Oxford, UK, 2006.
8. Hose, T. A3G's for Modern. Geotourism. Geoheritage 2012, 4, 7–24.

9. Vascanelos, C.; Moutinho, S.; Torres, J. Geothics in the context of Sustainability and its Teaching across the Curriculum. In Proceedings of the 8th International Conference of Education, Research and Innovation, Seville, Spain, 16–18 November 2015.
10. Gordon, J.E. Geoheritage, Geotourism and the Cultural Landscape: Enhancing the Visitor Experience and Promoting Geoconservation. Geosciences 2018, 8, 136.
11. McBriar, M. Foreword. In A Report Prepared for the Australian Heritage Commission by the Standing Committee for the Geological Heritage of the Geological Society of Australia Inc.; Joyce, E.B., Ed.; Standing Committee for Geological Heritage of the Geological Society of Australia Inc.: Sydney, Australia, 1995.
12. UNESCO. UNESCO Geoparks Programme—A New Initiative to Promote a Global Network of Geoparks Safeguarding and Developing Selected Areas Having Significant Geological Features; Document 156 EX/11 Rev., Executive Board, 156th session; UNESCO: Paris, France, 1999; p. 4.
13. European Manifesto on Earth Heritage and Geodiversity. 2004. Available online: http://www.progeo.pt/pdfs/Manifesto_EH.pdf (accessed on 9 May 2021).
14. Gray, M. Geodiversity: Valuing and Conserving Abiotic Nature; John Wiley: Chichester, UK, 2004.
15. Sharples, C.; Concepts and Principles of Geoconservation. Tasmanian Parks and Wildlife Service. 2002. Available online: http://www.dpipwe.tas.gov.au/Documents/geoconservation.pdf (accessed on 3 July 2021).
16. Brocx, M.; Semeniuk, V. Geoheritgae and geoconservation—History, definition, scope and scale. J. R. Soc. West. Aust. 2007, 90, 53–87.
17. Semeniuk, V. The linkage between biodiversity and geodiversity. In Pattern and Process—Towards a Regional Approach to National Estate Assessment of Geodiversity; Canberra ACT: Environment Australia Technical Series No 2; Eberhard, R., Ed.; Australian Heritage Commission: Canberra, Australia, 1996; pp. 51–58.
18. Semeniuk, V.; Semeniuk, C.A. Human impacts on globally to regionally significant geoheritage features of the Swan Coastal Plain and adjoining coastal zone, southwestern Australia. In Gondwana to Greenhouse: Australian Environmental Geoscience; Gostin, V.A., Ed.; Geological Society of Australia: Sydney, Australia, 2001; pp. 181–199.
19. Prosser, C.D.; Bridgland, D.R.; Brown, E.J.; Larwood, J.G. Geoconservation for science and society: Challenges and opportunities. Proc. Geol. Assoc. 2011, 122, 337–342.
20. Lazzari, M. Geosites, cultural tourism and sustainability in Gargano National park (southern Italy): The case of the Salata (Vieste) geoarchaeological site. Rend. Online Soc. Geol. It. 2013, 28, 97–101.
21. Mc Keever, P.; Zouros, N. Geoparks: Celebrating earth heritage, sustaining local communities. Episodes 2005, 28, 274–278.
22. EGN. European Geoparks Magazine No 7. 2005, p. 36. Available online: http://www.europeangeoparks.org (accessed on 9 May 2021).
23. UNESCO. Transforming our World: The 2030 Agenda for Sustainable Development. 2005. Available online: https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development% (accessed on 9 May 2021).
24. Herrera-Franco, G.; Montalván-Burbano, N.; Carrión-Mero, P.; Apolo-Masache, B.; Jaya-Montalvo, M. Research trends in geotourism: A bibliometric analysis using the scopus database. Geosciences 2020, 10, 379.
25. Robinson, A.M. Geotourism: Who is a geotourist. In Proceedings of the Inaugural National Conference on Green Travel, Climate Change and Ecotourism, Adelaide, Australia, 17–20 November 2008; pp. 909–923.

26. Farsani, N.T.; Coelho, C.; Costa, C. Rural geotourism: A new tourism product. Acta Geoturistica 2013, 4, 1–10.
27. Joyce, E.B. Geological heritage of Australia: Selecting the best for Geosites and World Heritage and telling the story for geotourism and Geoparks. ASEG Ext. Abstr. 2006, 2006, 1–4.
28. Kanellopoulou, G. The challenge of geotourism in Greece: Geocultural routes in Zagori region (NW Greece). In Proceedings of the IMIC, 1st International Conference on Experiential Tourism, Santorini, Greece, 9–11 October 2015; pp. 9–11.
29. Dowling, R.K. Global geotourism—An emerging form of sustainable tourism. Czech J. Tour. 2013, 2, 59–79.
30. Peppoloni, S.; Di Capua, G. The meaning of geoethics. In Ethical Challenges and Case Studies in Earth Sciences; Wyss, M., Peppoloni, S., Eds.; Elsevier: Amsterdam, The Netherlands, 2015; pp. 3–14.
31. Brocx, M.; Semeniuk, V. The '8Gs'—A blueprint for Geoheritage, Geoconservation, Geo-education and Geotourism. Aust. J. Earth Sci. 2019, 66, 803–821.
32. Chan, K.M.; Balvanera, P.; Benessaiah, K.; Chapman, M.; Díaz, S.; Gómez-Baggethun, E. Luck GW Opinion: Why protect nature? Rethinking values and the environment. Proc. Natl. Acad. Sci. USA 2016, 113, 1462–1465.
33. Slaymaker, O.; Spencer, T.; Embleton-Hamann, C. Geomorphology and Global Environmental Change; Cambridge University Press: Cambridge, UK, 2015.
34. Winter, C. The intrinsic, instrumental and spiritual values of natural area visitors and the general public: A comparative study. J. Sustain. Tour. 2007, 15, 599–614.
35. Papayannis, T.; Howard, P. Editorial: Nature as Heritage. Int. J. Herit. Stud. 2007, 13, 298–307.
36. Vucetich, J.; Bruskotter, J.; Nelson, M. Evaluating whether nature's intrinsic value is an axiom of or anathema to conservation. Conserv. Biol. 2015, 29, 321–332.
37. Drinia, H.; Tsipra, T.; Panagiaris, G.; Patsoules, M.; Papantoniou, C.; Magganas, A. Geological heritage of syros island, cyclades complex, Greece: An assessment and geotourism perspectives. Geoscience 2021, 11, 138.