

Review

# Geoheritage, Geotourism and the Cultural Landscape: Enhancing the Visitor Experience and Promoting Geoconservation

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**Abstract:** Geotourism spans a range of visitor interests, from the specialist geotourist to the more general visitor. As well as supporting geoconservation outcomes, it provides economic, cultural, relational and social benefits for both visitors and host communities. The interconnections between geoheritage and the cultural components of the landscape have antecedents in concepts of landscape aesthetics in different cultures. These interconnections provide a range of opportunities for enhancing the geotourist experience and promoting geoconservation and geoeducation by means of activities that involve aesthetic and emotional experiences and interpretation through different cultural filters that encourage the rediscovery of a sense of wonder both about the geological stories in the landscape and the human interactions. A cultural ecosystem services framework provides a holistic approach for informing conservation policy, management and planning for geotourism, enabling assessment of multiple benefits and trade-offs for visitors and communities based on the values of the geoheritage assets. Geotourism studies could also benefit from integration of existing theory, conceptual analysis and practice from broader heritage and nature-based tourism and closer collaboration with relevant social sciences. Adhering to sound geoethical practice is an essential part of geotourism, which can also play a role in the promotion of geoethics among the public and professionals.

**Keywords:** cultural ecosystem services; landscape aesthetics; geoheritage interpretation; geoparks; geoethics

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“...landscape is the work of the mind. Its scenery is built up as much from strata of memory as from layers of rock”.

(Simon Schama, 1995, p. 7) [1]

## 1. Introduction

Much of the focus in geoconservation over the last few decades, particularly in Europe, has centered on the protection of geosites primarily for scientific and educational reasons [2]. At the same time there has been growing recognition of the cultural and aesthetic values of geoheritage especially in relation to the development of geotourism [3–8] and UNESCO (United Nations Educational, Scientific and Cultural Organization) Global Geoparks which are required to deliver a range of educational, economic, cultural and social benefits as well as geoconservation [9,10]. Geotourism emerged in the 1990s [11,12] to promote wider awareness of geoheritage and its values beyond the geoscience community as a means to gain support for geoconservation at a time when sustainable development and eco- or nature-based tourism were attracting increasing attention. As a precursor to modern geotourism, tourism based on the aesthetic appreciation of the physical landscape and natural geological “wonders” is not a recent phenomenon. In various forms, it extends back over more than two centuries in Western Europe [13] and much longer in Asia [7].

Geotourism today is essentially a cultural response to the physical landscape. More specifically, it combines geologically based tourism in suitable locations with interpretation, education and awareness raising to foster geoconservation and sustainable economic benefits for local communities based on their geoheritage. Notwithstanding the different definitions proposed [12–20], geotourism may be considered to span a spectrum of interests and opportunities appealing to a range of visitors from “dedicated” geotourists to “casual” visitors [11,12,14,21,22]. The former are actively seeking to learn about geology and geomorphology as their prime motive for visiting an area; the latter, to appreciate scenery, enhance their experience of natural wonders in the landscape through cultural and aesthetic interests, and enjoy outdoor recreation, or simply to “be there”. Although, like ecotourism [23], geotourism may be viewed as originally a Western concept, it is now global in its reach [7,11,24,25]. As a cultural phenomenon, geotourism is part of a spectrum of activities embraced by natural area tourism and a microniche within niche tourism but with a distinctive focus on geoheritage [26,27]. The scope of geotourism includes a wide range and scale of geological and geomorphological features, from mountains and coasts to small rock exposures and the built environment [24]. These may occur in a variety of locations from natural areas to urban environments and include both geoparks and geosites, as well as buildings and monuments with geological associations.

As a contribution to progressing geotourism discourse beyond much of the current, and necessary, focus on the inventory of potential sites and case studies of geotourism activities, this paper reviews how the links between geoheritage and cultural heritage can be developed to enhance the visitor experience and advance geoeducation and geoconservation. The paper first outlines the range of connections between geoheritage and cultural heritage within an ecosystem services framework which is now widely adopted within the environmental science and policy communities; second, considers the changing cultural values, both historical and modern, placed on the physical landscape and geological features, and the lessons they provide for geotourism; and third, evaluates how the interpretation of cultural links can enhance the visitor experience and at the same time promote sound geoethical values. The full range of the visitor interest spectrum is addressed since geotourism in a broad sense has a vital role to play in raising awareness of geoheritage and the need for its conservation among a wider public. The term “nature” is used to include both the biotic and abiotic aspects of the natural world.

## 2. Geoheritage and the Cultural Landscape

Throughout history, people have placed different cultural values on nature, including its abiotic components. In modern times in Western thinking, these range from a Romantic view of the physical landscape in the 18th and 19th centuries as an aesthetic experience, to a scientific view of nature in the latter half of the 20th century as a focus for study and conservation in protected areas; and more recently, to a recognition of the need for sustainable use of natural resources that combines both the aesthetic and the scientific viewpoints and provides benefits for people, and embodied now in geoconservation and geotourism activities [28]. In contrast, Eastern and indigenous cultures have placed a much stronger emphasis on harmony with nature and landscape appreciation through different cultural filters [29]. Consequently, a landscape can be understood and appreciated as a cultural image [30], involving all its natural and cultural components existing in a symbiotic, rather than a dichotomous relationship [3,31–36]. For both the dedicated geotourist and particularly the general visitor who has less specialized interest in geology, the nature-culture symbiosis provides a means to enhance the visitor experience of engaging with geoheritage through different aspects of landscape appreciation.

Cultural heritage comprises tangible and intangible components. The former include movable (e.g., paintings, sculptures, manuscripts and fossils) and immovable (e.g., buildings, townscapes, monuments, archaeological sites and rural landscapes) constituents; the latter, oral traditions, performing arts, rituals, cuisine, traditional skills and technologies, religious ceremonies and storytelling. As noted by Panizza and Piacente [31,37], aspects of geoheritage may in themselves be

cultural elements of the landscape (e.g., as features celebrated in art, sculpture, music, poetry and literature or that are revered as sacred places), or may provide the essential context in which cultural features (e.g., settlements, castles and archaeological sites) are located. Geology and geomorphology are also a fundamental part of the distinctive character of many rural landscapes and the built environment and contribute to the aesthetic qualities of these landscapes. As described below, there are many connections between geoheritage and cultural heritage that provide a basis for geotourism activities. The value of these connections is now acknowledged within the UNESCO Global Geoparks framework [9]. Likewise, many cultural World Heritage Sites benefit from strong supporting geoheritage interests [38], while many existing natural properties are also cultural landscapes that have potential for re-inscription as mixed properties, recognizing their cultural and spiritual associations as well as their outstanding geoheritage features, as happened in the case of Tongariro National Park (New Zealand) (1992) and Uluru-Kata Tjuta National Park (Australia) (1994) [39].

The World Heritage Committee of UNESCO defined cultural landscapes as representing the “combined works of nature and of man” and “illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal” [40] (p. 14). Cultural landscapes fall into three main categories, all of which provide possibilities for geotourism: designed and created landscapes (parks and gardens, often with historic and/or religious monuments or buildings); organically evolved landscapes (that have developed their present form through human activities or occupancy interacting with natural environments); and associative cultural landscapes that have religious, artistic or cultural associations arising from the natural elements [40]. Cultural landscapes are at the interface between nature and culture and include both tangible and intangible components that are place-specific [41–43], but the traditional separation of the natural and cultural worlds in Western thinking makes little sense [44]. Apart from some parts of the polar regions, deserts and higher parts of mountain areas, most landscapes, including many so-called “wild” or “wilderness” areas, have been modified by people, and even the former all have strong cultural resonance (e.g., [45–50]). Landscape can therefore be perceived as a meeting ground between nature and people, past and present, and tangible and intangible values [44], and where there is a continuous interaction between natural processes and human activities that both shape and are shaped by each other [51,52]. This is reflected in the European Landscape Convention, which recognizes landscapes as the composite result of the action and interaction of both natural processes and/or human activities [53]; in effect, the landscape is a palimpsest recording, albeit incompletely, the geological and geomorphological history of the Earth and the interactions with human activities and cultural practices.

### 3. Geoheritage, Geotourism and Cultural Ecosystem Services

Cultural ecosystem services, a subset of ecosystem services, “has emerged as a concept around which researchers and decision makers can understand ecosystems in terms of their life-enriching and life-affirming contributions to human well-being” [54] (p. 208). Culture is not intrinsically an attribute of ecosystems, but is created through interactions between people, their values and the environment [55]. The Millennium Ecosystem Assessment (MEA) [56] defined cultural ecosystem services as “nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences” (p. 40). It identified ten categories: cultural diversity, spiritual and religious values, knowledge systems, educational values, inspiration, aesthetic values, social relations, sense of place, cultural heritage values, recreation and ecotourism (Table 1). Although recreation and nature-based tourism were considered to be a service in the MEA, they are more appropriately regarded as benefits or cultural goods [55]. Notwithstanding the difficulties in classifying and measuring cultural ecosystem services, the overlaps in the categories and the conflation of values, services and benefits in the MEA [55], the concept is nevertheless useful in exploring the interconnections between geoheritage, geotourism and the cultural landscape. These

interconnections involve complex interactions of cultural practices and values within environmental spaces (in this case geosites and geoparks). As well as providing economic benefits from tourism activities, they also give rise to a range of relational benefits: shaping people's identities (belonging, sense of place, spirituality); experiences (tranquility, inspiration) that enhance well-being, mental and physical health; and knowledge skills and capabilities [55]. Cultural ecosystem services can therefore be set in a relational framework, in which people interact with nature, rather than a deterministic one [54,57]. "Places, localities, landscapes and seascapes enable cultural practices to occur, but are also created through them" [54] (p. 213). Cultural ecosystem services also have value in themselves and can play an important part in generating support for ecosystem conservation [58], while appreciation of aesthetic and spiritual values can encourage people to develop moral responsibilities towards nature [59]. An ecosystem services approach can therefore provide a holistic framework for analysis and evaluation that incorporates the multiple economic, cultural and social values of geotourism and thereby help to inform policy, management planning and practice.

Geodiversity and geoheritage contribute significantly to cultural ecosystem services and benefits (Table 1). Geodiversity links the Earth, people and culture [60]. It has intrinsic, instrumental and relational values that underpin geoheritage and provide or contribute to a range of benefits for society and people [61–66]. The varied connections between geoheritage and cultural heritage are reviewed elsewhere (e.g., [6,37,64,67–69]). As outlined below, these have the potential, or are already being deployed, to enhance geotourist experiences, both through new and engaging avenues for interpretation and through embracing the aesthetic appeal of geosites and geoparks as visitor destinations.

First, the diversity of the physical environment is one factor influencing the diversity of cultures, cultural identity and people's sense of place. For example, glaciers, volcanism and glacial outburst floods have been powerful forces in shaping Icelandic society and culture [70,71] (Figure 1a,b), celebrated for instance in the poetry of Jónas Hallgrímsson (1807–1845) [72]. Natural rock formations, mountains, glaciers, volcanoes, caves, lakes, rivers, waterfalls, erratic blocks and other landforms often have religious or spiritual values and cultural meanings (Figure 1c), expressed through geom mythology, local folklore and legends [73–76]. Such features are also modern geotourism attractions where visitors can learn not only about the shaping of the planet and associative cultural interests, but also enjoy more adventurous activities such as glacier hiking and visiting active volcanoes, show caves, mines and lava tubes [75,77–81].

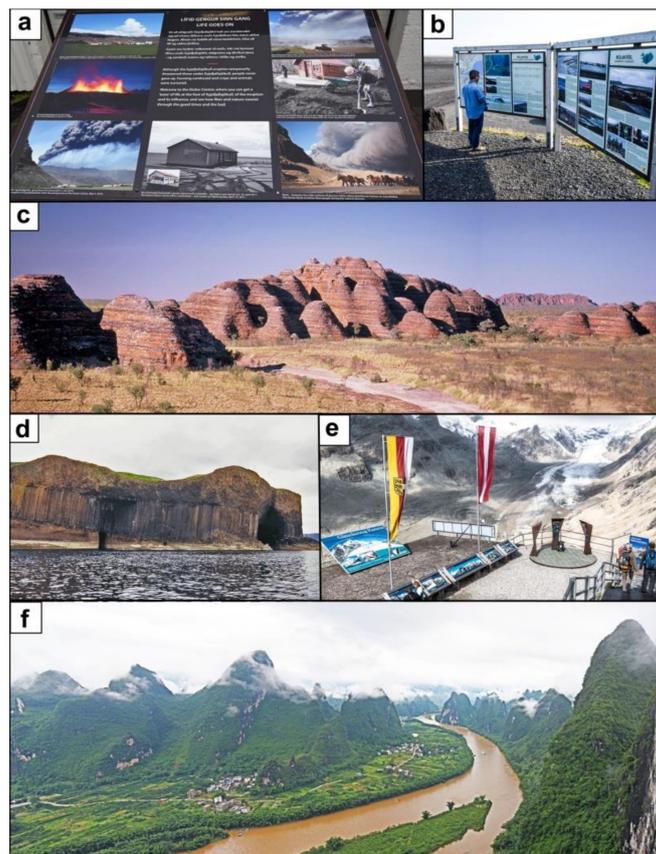
Second, natural features play an integral part in determining landscape character. Many geosites have become iconic places (e.g., the Grand Canyon, Uluru, the Matterhorn and the Giant's Causeway), globally recognized with cultural, religious, symbolic and economic values [82,83]. Many are appreciated for their aesthetic value [67], which refers to sensory, usually visual (but also nonvisual), appeal both in a passive receiving (e.g., appreciating a view) and an actively sensing (e.g., through hiking in the mountains) context based on aspects of harmony, variation/contrast, scenery/viewing, genuineness and art/architecture [84]. All of these aspects are inherent in geoheritage features and experienced by the visitor through an interplay of the senses. Hence many people are attracted to visit geoheritage sites through their aesthetic appeal or visual attractiveness as remarkable landforms or landscapes [69,85] (Figure 1c–f). This appeal may be enhanced through connections with art, sculpture, photography, music, poetry, literature, history and archaeology. The physical and cultural elements in most landscapes are closely interlinked and reflected in landscape character, land use and human activities. This includes the built environment, urban landscapes and designed landscapes (e.g., through influences on the physical setting or the use of local building stones and vernacular architecture), as well as localities representing industrial archaeology and mining heritage. These all offer opportunities for increasingly city dwelling populations to engage with, and benefit from, geoheritage (e.g., [86–88]).

Third, geotourism can help to foster understanding of geology and geomorphological processes in relation to current environmental issues, including climate change, sea-level rise, flooding and

other natural hazards, as well as developing sustainable environmental management that integrates geodiversity, biodiversity and socioeconomic awareness, together with better public understanding of the issues and more informed public debate and engagement about difficult adaptation decisions that will need to be made [65,89–92]. For example, mountain geosites have scientific and educational value in conveying clearly the impacts of climate change and the role of dynamic processes in shaping the landscape [81,93,94] (Figure 1e). Recent glacier recession is strikingly demonstrated through comparisons of historical photographs and paintings (e.g., [95–97]), as well as in conspicuous environmental changes [98–100] that are already having an impact on tourism [77,81,101–103]. The ways in which different societies perceive glaciers and their changes [104–107] can also enhance interpretation for geotourists. Similarly at coastal sites, art can be a useful tool in informing understanding of coastal changes [108], while educative interpretation can raise awareness of the significance and implications of sea-level rise [109]. Often geosites also have ecological educative value [4]. Most species and plant communities depend on specific geological, geomorphological and soil conditions [110], which can be used to highlight the ecological significance of geodiversity. Similar connections are demonstrated in particular types of land use, such as viticulture [111].

**Table 1.** Cultural ecosystem services and benefits arising from geodiversity and geoheritage (adapted from [56,61–64]).

Cultural Ecosystem Service Category/Benefits	Description
Cultural diversity	The diversity of the physical environment is one factor influencing the diversity of cultures and cultural identity.
Spiritual and religious values and cultural meanings	Natural rock formations and landforms often have associated religious or spiritual values. They also feature in local folklore and legends.
Knowledge systems	Society benefits from knowledge of the Earth’s physical properties, materials, processes and history in many ways (e.g., through applied, engineering and environmental geology, medical geology and geoforensics). Records of past climate and environmental changes preserved in a variety of archives (e.g., ice cores, ocean sediments, landforms and lake sediments) enable a longer-term perspective on Earth system processes and ecosystem dynamics, trends and human interactions. They provide baselines for environmental monitoring and forecasting, and can indicate possible ecosystem responses to future changes in climate and other factors.
Education	Geodiversity provides the basis for both formal and non-formal education for people of all ages, through desk-based learning and outdoor learning opportunities.
Artistic inspiration	Geodiversity provides a rich source of inspiration for art, literature, poetry, music, sculpture, national symbols, architecture and built heritage and gardens.
Aesthetics	Many people find natural beauty and aesthetic value in various aspects of the natural environment, scenery and scenic views, interesting/beautiful/dramatic landscapes and silence/tranquillity/peacefulness.
Social relations	Changes in ecosystem services (e.g., availability of fresh water, flood regulation or erosion regulation) can affect social relations, particularly in cultures that have retained strong connections to their local environments. Volunteering through Local Geoconservation Groups can also provide opportunities for social interaction.
Sense of place	Many people value the sense of place that is associated with recognized features of their environment, such as natural rock formations and landscapes, and the perceived “feeling of security” and character created by those features.
Cultural heritage and geoheritage	Geosites associated with major developments in geoscience are part of the cultural value of geoheritage. Other geosites are significant for their historical, literary or artistic associations or other cultural meanings. Geodiversity underpins landscape and seascape character and different types of cultural landscape. The use of local or traditional stone and other geological materials within the built environment and the conservation of cultural landscapes contribute to the cultural heritage of an area and its landscape character. Cultural memories are often expressed through natural features such as mountains, waterfalls and rock formations.
Environmental quality	Geodiversity and geoheritage contribute to environmental quality which supports people’s health and well-being.
Recreation and nature-based tourism	People often choose where to spend their leisure time based on the characteristics of the natural or cultural features in a particular area. Physical features (geodiversity) underpin landscape character, valued habitats and ecosystems, and the aesthetic and other cultural qualities of an area. They provide opportunities for outdoor recreation (e.g., walking, rock climbing, caving, skiing and outdoor adventure) and leisure, or a peaceful haven in which to relax and reflect, and contribute to people’s health and well-being. They also support geotourism, which in turn provides a source of employment (e.g., in geoparks) and a range of relational and other benefits described above that contribute to people’s health and well-being and educational and life-long personal development.



**Figure 1.** (a) Interpretation board at Eyafjallajökull Visitor Centre, Iceland, explains that “life goes on” after the volcanic eruption of April 2011. (b) Interpretation board at Múlavísl, Iceland, explains the effects of the jökulhlaup in 2011, which destroyed a major bridge on the island’s main ring road. (c) The Bungle Bungle Range in Purnulu National Park and World Heritage Site, Australia, is becoming an increasingly popular tourist destination. It is an outstanding example of cone karst in Devonian sandstone, supports a diverse range of habitats, from deep, sheltered gorges to semi-arid plains, and has special spiritual and cultural significance for local Aboriginal clan groups. (d) The Palaeogene volcanic features at Fingal’s Cave, Staffa, Scotland, have been a tourist destination since the late 18th century and a source of inspiration for poetry music and art. (e) The retreat of the Pasterze Glacier, the largest glacier in Austria and the Eastern Alps, in the Hohe Tauern National Park, has increased in response to warmer summer temperatures and lower snowfall. A major tourist attraction, the Kaiser-Franz-Josefs-Höhe Visitor Centre offers panoramic views over the glacier and the Grossglockner massif, Austria’s highest mountain. Information boards and an educational glacier trail explain the glacial processes and history of retreat. (f) The spectacular karst landscape of Guilin and the River Li, China, is a World Heritage Site celebrated in poetry and painting for many centuries. Photos: John Gordon.

Fourth, in addition to tangible benefits in the form of economic returns to local communities, geotourism confers relational benefits through opportunities for recreation, outdoor activities and physical challenges, as well as aesthetic, inspirational and spiritual experiences that directly contribute to people’s health and well-being and to educational and lifelong personal development (Table 1) [112,113]. Geotourism also enables people to reconnect with nature. This is important because people’s experiences of nature have increasingly become diminished, with consequent damaging effects on health and well-being and adoption of negative attitudes to the environment [114,115].

## 4. Geoheritage, Landscape Aesthetics and Geotourism

### 4.1. Western Cultural Values and the Roots of Modern Geotourism

In Western Europe, the cultural values of geodiversity and geoheritage have changed over time and are linked with parallel developments in landscape aesthetics, geoscience and, latterly, geoconservation. In particular, literature and art played an important part in transforming perceptions of the landscape from a physical to a cultural construct with aesthetic value [1,116]. The roots of modern geotourism lay in the European Romantic movement of the mid-18th to the mid-19th centuries and the development of landscape aesthetics [117,118], although in many other cultures the appreciation of landscape and geological features is much older [7,48,50]. The Romantic movement saw a change in perception of “wild” landscapes, particularly mountains and spectacular natural phenomena such as caves, volcanoes and waterfalls (e.g., [14,75,119,120]), from places to be feared and avoided to landscapes to be appreciated through a “romantic gaze” [121]. The aesthetics of the sublime [122] and picturesque [123], respectively, inspired feelings of awe and admiration (Burke’s “delightful terror”) in the presence of geological “wonders”, or contemplation of the compositional qualities of “natural” landscapes [124]. The representation of the physical landscape in travel journals, literature and art [14,117,125–131] inspired writers, artists, poets and members of the wealthy classes and social elites in Britain and elsewhere in Europe to seek out and experience beautiful, sublime and picturesque scenery as part of a shift from the “classical” to a more “romantic” Grand Tour in the mid-17th to early 19th centuries and before the development of mass tourism in the mid-19th century [13,132,133]. This is well illustrated in the case of mountain aesthetics.

Although nature poetry featured in Western classical civilizations (e.g., [134]), during the Middle Ages, wild nature and notably mountains were perceived as dangerous and fearsome places [48,135,136]. Particularly influential in transforming the perception of mountains were the accounts of sublime landscapes of the Alps celebrated in the influential works of Jean-Jacques Rousseau (1712–1778), Thomas Gray (1716–1771) and William Wordsworth (1770–1850), and later Lord Byron (1788–1824), Percy Bysshe Shelley (1792–1822), John Ruskin (1819–1900) and their continental counterparts, Johann Wolfgang von Goethe (1749–1832), Johann Christoph Friedrich von Schiller (1759–1805) and Alexandre Dumas (1802–1870). By the mid-18th century, as documented for example in the journals of those crossing the Alps on the Grand Tour [132], travelers were appreciating the beauty and grandeur of the mountains, while writers, artists, poets and members of the aristocracy visited in increasing numbers specifically for recreation, scientific or health reasons, rather than simply passing through [137]. Romanticized by writers, poets and artists, mountains gained a strong aesthetic appeal for their sublime and unspoiled beauty, and by the end of the century tourists were regularly making excursions to the Mer de Glace and Glacier des Bossons [132]. Mountaineering also became an increasing attraction from the late 18th century [138].

Mass tourism in the Alps and elsewhere was facilitated in the second half of the 19th century by improvements in transport, through railways and steamships, and the development of package tours following Thomas Cook’s first venture to the Alps in 1863 [139]. Also influential were Goethe’s travels in Italy [140] and to the “rock cities” in central Europe [130], as were the sublime attractions of active volcanoes [74,119]. At the same time, tourist guidebooks and popular geology books [14] written for a mass market of visitors underpinned a huge growth of the travel industry focused on natural wonders. In North America, railways opened up the Rockies to tourists and climbers inspired by the publications of Henry David Thoreau (1817–1862) and John Muir (1838–1914), both influenced by the vision of Alexander von Humboldt (1769–1859) of the unity and wonder of nature [141], and by the sublime paintings of the Hudson River School and the work of contemporary photographers [142].

This historical perspective highlights the contribution of physical features in the development of Western landscape aesthetics and the role of the latter in early tourism. These developments took place at a time when geology was perceived as an exciting subject among the reading public, presented in a romantic, literary way that appealed to the imagination. Popular books related stories

of past worlds beyond a human timescale, blending geology together with folklore, legends and local scenery [143–145]. For poets, writers and artists, geology was a powerful source of inspiration that offered new ways of seeing the landscape, while in the popular imagination writers and artists inspired a sense of wonder and curiosity about the physical landscape and its aesthetic qualities. The rediscovery of such a sense of wonder can make key contribution to the wider development of modern geotourism [127,129,146,147].

#### 4.2. Eastern and Indigenous Cultural Values

The Romantic movement was a product of European culture at a particular time. Elsewhere, people have responded differently to the natural world, reflecting the contention that there is no single nature, but rather multiple natures constructed by different societies [23,29,148–151]. In Eastern cultures, there is a long tradition of respect, harmony and synergy between humans and nature, embodied in the concept of the cultural landscape (e.g., [152]). Geological characteristics are fundamental to perceptions of the scenic quality and natural beauty of this cultural landscape [7]. For example, mountains, rivers, waterfalls and other natural features have all been recurring motifs in Chinese painting, poetry and travelers' journals for over two millennia, celebrating the sacred character of nature and the connectedness of humans and nature (e.g., [7,153–155]). In contrast to the Western tradition of regarding nature and culture as separate elements of the same landscape, and which idealizes nature and wilderness protection free from human intervention, the traditional view of nature deeply rooted in Chinese philosophies is that nature and culture are indivisible and form a cosmological whole [7,43,156].

As people and nature are perceived to be in harmony in Chinese traditions, human intervention and manipulation of nature can enhance landscape appeal. Hence the installation of temples, carvings, inscriptions of poetry in stone, and artificial lakes and gardens in natural environments enhances rather than detracts from appreciation of the natural landscape, compared to Western preferences for the preservation of wild nature [157]. Chinese perceptions of landscape are strongly influenced by idealized images portrayed in paintings and poetry [158], so that Chinese tourists tend to view natural places in terms of their cultural meanings and significance. Consequently, their experiences of landscapes differ from those of Western tourists [159–161] and their motivation is often in the form of a pilgrimage to places that feature in poetry and paintings (e.g., the Guilin karst—Figure 1f) or have other cultural associations [158,162]. They are there to view the beauty of the physical features but gaze at them through cultural filters involving landscape memories and intangible cultural heritage [162,163]. Li [160] termed this distinctive Chinese gaze, the “harmony gaze”. In contrast in Western cultures, the aesthetics of nature and art have diverged [164].

In Western societies, spiritual attachment to nature declined during the scientific flourishing of the European Enlightenment. For many indigenous peoples, however, natural features remain an integral part of their culture and beliefs (e.g., [165]). Indigenous peoples have a strong kinship with nature, based on long connections with place, and take their identities and systems of beliefs from their natural surroundings. This is expressed, for example, in the traditions and philosophy of “Pachamama” (“Mother Earth”) in Andean indigenous communities in Latin America. Similarly, for Indigenous Australians, landscape features form part of their spirituality expressed through dreamtime stories and ceremonies, and embodying deep connections with the physical landscape which they experience in different ways and respect through the concept of “caring for country”. Hence geoheritage features such as Uluru, Kata Tjuta and the Bungle Bungle Range (Figure 1c) have special spiritual significance. In contrast in Western cultures, Ellison [166] described how the “suffocating embrace of romantically-infused notions of landscape has cut humans off from nature and from the world” (p. 87) and advocated that landscape artists, ecologists and environmentalists need to re-engage with the concept of humans as part of the natural world—that nature is not something “out there”.

## 5. Discussion

### 5.1. Enhancing the Visitor Experience

The success of geotourism in delivering its goals of geoheritage education, sustainable development and geoconservation is ultimately dependent on the quality of the visitor experience [27]. If visitors have a deeper awareness and connection with geoheritage through meaningful and memorable experiences, they are more likely to value it and help to manage it sustainably [113,167,168]. Interpretation planning is therefore crucial [169]. Although some evidence is inconsistent [170], well-planned and well-designed interpretation delivered to high standards by committed guides [24,171] is most likely to achieve satisfaction for the majority of general visitors and influence environmentally sensitive behavior and attitudes [168,172,173] and to help to manage the negative impacts of geotourism and recreation such as on-site damage [24,174].

Visitors have diverse motives and interests. Interpretation therefore needs to meet the requirements of a broad spectrum of audiences from the specific site-related geological and educational information for the dedicated geotourist and those actively seeking to learn about the geology of an area, to the broader interpretation that will engage and enthuse the casual geotourist and those simply wishing to “be there”, not only so that their experience is enhanced but also that their awareness of geoheritage and the need for its conservation is increased [11,21,175]. From a commercial perspective, the focus will tend to be on the general visitor, but the interests of the dedicated geotourist must also be met. Different approaches and messages are needed for different audiences [22], and the challenge is to interpret geoheritage in meaningful ways that involve active engagement and follow best practice principles [167,168,176,177]. As noted above, appreciation of the physical landscape is not a new phenomenon, but the goals are different and modern methods and approaches are available to enhance the visitor experience and their awareness of geoheritage [130]. While the geoheritage features themselves must have a strong story to tell, their cultural connections have a vital part to play, particularly in engaging the interest of the non-specialist visitor.

Whereas in the 18th and 19th centuries, people experienced geoheritage through landscape aesthetics, literature and romantic tourism and through the spectacular appeal of past worlds, the modern didactic approach to geological interpretation has frequently provided information overload through on-site panels, leaflets, and other media. The focus on reading the landscape [178] has involved geologists telling their stories and presenting their way of understanding the landscape [179]. This is fine for the dedicated geotourist already interested in geology and geomorphology. However, the purpose of interpretation should be to inform and entertain as well as to educate, as recognized by one of the founders of modern geology, James Hutton [180], who remarked that study of the Earth “may afford the human mind both information and entertainment” (p. 30). But it must also provide more meaningful experiences. This was appreciated by Friedrich Nietzsche who began the foreword to his essay (published in 1874), *On the Uses and Disadvantages of History for Life*, with a quotation from Goethe emphasizing the value of knowledge for enriching life: “In any case, I hate everything that merely instructs me without augmenting or directly invigorating my activity” [181] (unpagged).

Emotions play an important part in augmenting or invigorating visitors’ memorable experiences [89,113,182,183], involving other senses than just “gaze” [133]. Emotional experience is a strong influence on subsequent behavior, particularly personal experiences that are unique and unexpected [184]. Ham [168] stressed the importance of provoking deep personal thought and making personal connections as a basis for subsequent positive actions by visitors. For the great majority of visitors, therefore, the challenge is to enhance their experiences beyond the presentation of “information medicine” [185] by providing interactive engagement on an emotional and imaginative level that enables the rediscovery of sense of wonder, inspiration and enchantment about the landscape and its natural features [127,129,146,186–188]. This includes embracing the cultural landscape and engaging with the artistic in a way that connects with the imagination [185].

The Irish poet, Seamus Heaney [189], explored the concept that poets and geologists transform geological landscapes into cultural landscapes, so that rocks and landscapes can take on new meanings for people when viewed from a cultural perspective. The stories in the rocks and their cultural associations provide opportunities for people to reconnect with geoheritage, and experience a renewed sense of wonder. This is particularly the case for those who might otherwise have little interest in the geological detail. Such an approach can also help to link people with their cultural roots and enhance their sense of place and connections with the natural world [190,191]. It should be recognized, too, that traditional indigenous knowledge is an integral component of site management and interpretation [23,41]. This cultural element can introduce new stories that engage visitors, enrich their experiences and enhance understanding of contemporary environmental issues [192]. For example, indigenous people attribute different cultural values and animate meanings to glaciers compared with Western values that emphasize landscape aesthetics, wilderness, natural hazards, sublime scenery, mountaineering and tourism [104–107].

This means shifting the emphasis from appreciating landscape stories through geologists' eyes to alternative storylines about the landscape [41,127,147,193–196]. Interpretation of cultural links can enhance the geological stories and offer alternative ways of attracting and engaging visitors and adding to their experiences [197]. Artists, musicians, poets, writers, geoscientists and local people interpret the landscape in different ways. Exploring the landscape through these different cultural filters [117] can provide memorable personal experiences for visitors and enable a more holistic view of the landscape. Such an approach to interpretation can bring together Western and Eastern cultural traditions. For example, studies of interpretation in some Chinese geoparks reveal that the traditional Western-style didactic approach, involving presentation of overly technical information, is ineffective and ignored by a majority of visitors [162,198]. On the other hand, for many visitors, geoheritage is more likely to be appreciated through guided tours and involving stories, art and poetry. Such media can make cultural and aesthetic connections and emotionally engage visitors with the landscape and its geoheritage, reflecting the principle that interpretation should relate to the audience and be culturally relevant [161,162,198–200]. Providing it is done well, such engagement with the cultural landscape is not “dumbing down” the geology, but involves the enrichment of knowledge. Rather than simply present information, many geoparks already promote links between geoheritage and other aspects of the area's natural and cultural heritage through innovative interpretation that integrates geological and cultural history based around trails and on-site panels, digital tools and novel exhibits and installations of rock sculptures and land art designed to stimulate people's interest, along with creative experiential engagement with local schools (e.g., [201–203]). This parallels the growing interest in art-based science education [204,205] and, more widely, a cultural turn towards geology as a source of artistic and literary creativity to contextualize life in the modern world and the role of humans in changing the planet [206].

As in the past, and recognized in the UNESCO Global Geoparks Network [9], the aesthetic appeal of the landscape is a highly valued asset, particularly for the general visitor, but the challenge is to introduce awareness of geoheritage and geoconservation as an element of the aesthetic appreciation of the landscape [22] and in a manner that does not compromise the aesthetic qualities of the landscape [207]. The aesthetic should complement and enhance the science, providing a pathway to introduce and educate visitors about the physical environment [208], while knowledge should enhance the appreciative sensory experience through “participatory engagement” with the environment [164]. Appreciating the landscape and engaging the emotions are more powerful than simply learning about the science alone. As noted earlier, the range of benefits from geotourism is not only instrumental or utilitarian, but includes relational benefits that should be fully addressed in management planning and practice.

In order to achieve its objectives, geotourism should not be an exclusive experience for dedicated geotourists but should cater for a spectrum of visitor interests and activities depending on the nature of the site. This will require judgements about different uses—what are the activities and experiences

most likely to foster geoconservation? It will require development of mapping, spatial inventories and indicators at regional and local scales to assess the potential for different activities and the sensitivities of particular geosites (e.g., [5,209,210]) and implementation of good-practice guidance for visitor management [211]. As recognized for tourism [212] and ecotourism [213,214], the Tourism Opportunity Spectrum is a tool that may be useful for managing geotourist activities and to guide management decisions and planning to accommodate different interests sustainably. It incorporates attributes of site access, compatibility with other activities, attractions and types of experience offered, existing infrastructure, social interaction of visitors and host population, level of skill and knowledge, acceptability of visitor impacts, and acceptability of a management regime.

### 5.2. Geotourism: Bridging the Nature–Culture Divide

The connections with the cultural landscape provide opportunities to promote the values of geoheritage to a wider public constituency. This aligns with the “new paradigm” in nature conservation that emphasizes “people and nature” and recognizes community needs and the value of joint management approaches [215–218]. It also connects with the UN Sustainable Development Goals, where geotourism can both help to promote the role of the geosciences [92] and contribute directly to the delivery of specific goals (e.g., Goal 8: Promote inclusive and sustainable economic growth, employment and decent work for all).

The concept of “biocultural diversity” has been suggested as a way of overcoming the nature–culture divide [219]. It requires finding a balance between Western scientific approaches to nature conservation and stewardship with approaches grounded in alternative concepts of “being part of the natural world” [165,219] and that nature in all its aspects should be part of everyday experience, connected with human lives and with humans as part of nature [115,220]. One could equally suggest a parallel concept of “geocultural diversity”, but compartmentalizing in this way is unhelpful as it negates the interweaving of geodiversity, biodiversity and people and the recognition that nature is the unity of the biotic and abiotic. Indeed, Harmon [221] emphasized this unity and advocated the inclusion of abiotic diversity within the concept of “biocultural diversity”. Similarly, Kellert [222] argued that we need to develop a synthesis of Eastern, Western and indigenous cultural traditions, bringing together appreciation of the wholeness of nature and existence in harmony with the natural world, with Western concepts of environmental stewardship and sustainable management based on empirical understanding. In practice, however, the complexities of managing landscapes in the face of widely differing cultural interests and philosophies should not be underestimated, as demonstrated in the case of Uluru-Kata Tjuta National Park [223].

Recognizing that there is an opportunity spectrum for geotourism that embraces both the dedicated geotourist and the more casual visitor should enable geoheritage values be promoted to a much wider and nonscientific audience and in ways that promote a more holistic awareness and appreciation of the links between geoheritage, biodiversity, landscape history and the cultural characteristics and heritage of an area [175,224]. Consequently, geotourism may be viewed as a form of sustainable tourism that incorporates themes from various sectors such as integrated rural tourism, cultural and heritage tourism and community-based tourism [225]). This approach, advocated in the Arouca Declaration [20], integrates geology, environment, culture, aesthetics and heritage, but as noted by Martini et al. [226], it has geology as a central focus (cf. [227]) and embraces geological tourism for dedicated geotourists as one of its essential components. In this respect, it differs from the broad National Geographic definition of geotourism [228]. Martini [229] also argued that we must think in terms of whole areas that are coherent in terms of geography and society and not isolate geoheritage from other types of heritage within any given territory. He advocated that to make the most of geosites and protect them, it is necessary to understand and integrate the cultural context and the values of the territories in which they are situated.

In a similar vein, Stoffelen and Vanneste [19] proposed a reinterpretation of geotourism in order to provide a holistic analysis of landscape to incorporate various society–nature interactions

and meanings. Integrating nature (including geodiversity) with people through cultural filters also implicates an ethical responsibility to protect it and pass it on to future generations with the options to apply their own values (see below). This approach requires specialist knowledge in assessing and identifying appropriate sites for geotourism, managing these sites to enhance geoconservation and contributing to engaging interpretation and education (e.g., through museums, visitor centers, exhibitions, guided tours, interpretative panels and websites) and activities that facilitate the comprehension of geoheritage by the visitors [24,34].

### 5.3. Geotourism and Geoethics

Geotourism has a cultural role in the developing field of geoethics. According to Peppoloni and Di Capua [230], geoethics through the development of geotourism and UNESCO Global Geoparks promotes geoeducation, aiming to develop awareness, values and responsibility for geoheritage, especially among young people. By creating awareness of the value of a region's geological heritage, "geological culture and geoethics can strengthen the links between people and their land, between the places of their origins and their own memories" [231] (p. 339). Education can also highlight messages about environmental issues and sustainable use of natural resources, including the consequences of ignoring the loss of geoheritage [232]. Importantly, an ethical approach is not restricted to the economic sustainability of natural resources, but must include the life-enhancing value of nature as a subject of sensual, contemplative, spiritual, religious and aesthetic experience to be passed on to future generations [57,233,234]. The contention that nature has intrinsic value that should be protected for its own sake is often based on spiritual or metaphysical beliefs, but it also arises from moral considerations and the responsibilities of human beings towards the natural world and to maintain the diversity of the world's natural and culture heritage [221,235,236].

Adhering to good geoethical practice is an essential part of geotourism both among providers and participants. In addition, geotourism should help to promote and enhance awareness of geoethics among the public [237]. There are several aspects to this. First, geotourism activities and infrastructure must be sustainable and incorporated, where appropriate, into the aesthetics of the site, and they should enable geoconservation without damaging the features of interest or causing other environmental impacts [24,27]. Second, they should be sensitive to the values and cultures of local communities, recognizing that the latter may hold different norms, values and interpretations of the landscape, as well as incorporating local knowledge fundamental to sustainable management of the geotourism assets. Commodification of geoheritage as a resource for geotourism may not align with local cultural values [23], but sensitive community participation should help to encourage a wider sense of ownership [238–240]. This may include management zoning or employment of local guides in sensitive areas to present indigenous interpretations of the landscape [41]. Such cross-cultural collaboration involving local and indigenous people can help to maintain traditional knowledge and culture, while delivering geoconservation [239,241]. Third, geotourism should be guided by ethical principles to ensure that commercialisation does not destroy harmony with nature [242] and that the geotourism experience combines enjoyment of the aesthetic features of geoheritage with gaining knowledge about their interest and value, while minimizing management or infrastructure footprints that impact on the aesthetic experience. Part of this includes reconciling contrasting expectations and demands of tourists from different cultures and with different backgrounds [242]. Fourth, risk assessment of hazards must be fully taken into account in evaluating the potential use of geosites for tourism and in their subsequent management. Large numbers of visitors to inherently dynamic sites may expose visitors to hazards with risk of injuries or death [75,243,244], but geotourism also has an important role in educating visitors about natural hazards [245]. Fifth, geotourism can help to promote sustainable use of natural resources that recognizes the value of local knowledge and the spiritual connections between people and the land [246,247]. Sixth, geotourism interpretation and education also provide opportunities to raise awareness and discuss broader geoethical issues. This includes encouraging a positive attitude to the values of geoconservation and promoting sustainable environmental management based on better

appreciation of geology and geomorphological processes and the implementation of geoconservation principles such as “working with natural processes” [66,248]. In turn, this should enable better public understanding and more informed debate about natural hazards and global changes in the geosphere. Finally, geotourism has a part to play in educating geoscientists about geoconservation and good practice such as responsible rock coring [249,250].

## 6. Conclusions

Progressing geoconservation depends on better public awareness, understanding and support. Geotourism has a vital contribution to make in achieving these goals. Strong geological stories that appeal to the imagination are essential, but the visitor experience for both dedicated and casual geotourists can be enhanced through explorations of the connections between geoheritage and the cultural landscape. Interpretation that involves aesthetic and emotional experiences and encourages the rediscovery of a sense of wonder and a more holistic appreciation of nature, people and landscape is likely to have wide appeal and be most effective.

To be sustainable, geotourism must promote and strengthen geoconservation [251], not conflict with it for commercial gain, and geoconservation must work for both people and the land in a harmonious relationship [252]. Geotourism needs to be integrated with best practice management to preserve and enhance the visitor experience and protect the resource [253]. For many, aesthetics are a significant part of the destination experience, if not a primary factor [162,254], so that a challenge for the management of geotourism is to provide access to places of scenic beauty and natural wonders in a way that not only avoids development which detracts from the aesthetic experience [120,207,252], but also accommodates divergent cultural perspectives and ensures the well-being of local communities and visitors, as well as maintaining the full range of ecosystem goods and services upon which they, and geotourism, depend.

While the cultural landscape offers rich potential to engage a wider audience, there remains a need to evaluate the cross-cultural expectations of visitors [200,255] and the kinds of desired activities and meaningful and memorable experiences that will best connect people to geoheritage in a way that will influence their attitudes and increase support for geoconservation [113,198,254]. Visitor demand for, and success of different approaches to interpretation merit further investigation linked with the broader heritage and nature-based tourism research agenda and detailed analysis of: (1) what geotourists actually want [161,162,256]; (2) destination image and reality [257]; and (3) management options and the effectiveness of geotourism in raising visitors’ awareness of geoheritage and changing their behavior [258]. There are important historical lessons about rediscovering a sense of wonder through aesthetic and emotional experiences, although the role of emotional content in destination experiences for geotourists remains to be evaluated [183]. However, rather than re-engagement in a romantic way, there should be a focus on people as part of nature. Linked to this is a need for a stronger academic foundation for geotourism which could benefit from existing theory, conceptual analysis and best practice from other forms of heritage and nature-based tourism [259]. This will require closer collaboration with relevant social sciences to develop multidisciplinary approaches with a range of stakeholders. A cultural ecosystem services framework should be valuable in this respect, and particularly relevant in the case of UNESCO Global Geoparks, which are required to deliver both geoconservation and a range of benefits for people. Specifically, a cultural ecosystem services framework can highlight multiple benefits, as well as trade-offs, and support integrated resource and environmental management that includes links to human well-being and delivery of different services [260,261]. Further analysis is also required to develop new insights into how cultural ecosystem services and benefits influence visitor motivations, expectations, behaviors and levels of satisfaction and how these might be carried through into planning and management practice [260].

The assessment of geoheritage assets, values and benefits within a cultural ecosystem services framework can enable a more holistic approach to geotourism, recognizing the connections between people, geoheritage and the landscape. In addition to geoconservation outcomes and economic

returns for communities, wider relational benefits for participants include improved health and well-being through aesthetic and spiritual enrichment, possibilities for recreation, physical activity, inspiration, reflection, acquiring scientific knowledge and reaffirming cultural identity. In view of the growing importance of the ecosystem approach in environmental policy, management and decision making, active engagement by the geoscience community is required to ensure that geotourism is fully factored into wider assessments of ecosystem services and nature's contributions to people (e.g., [262]). Promoting the values of geotourism and the benefits to society has an essential part to play in gaining wider recognition for geoheritage and support for geoconservation.

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