

Geotourism – Enhancing the Cave Visit and Karst Landscape Experience

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Abstract

Jenolan Caves, along with the Great Barrier Reef and Blue Mountains, was among the top three international tourist destinations in Australia before WWII. The Caves were managed by the NSW Government from the 1860s, and they invested in developing them as a controlled and protected tourist site. Government involvement also ensured that cave tourism at Jenolan became a model of conservation and tourism management (i.e., what we now know as ‘place-based’ geotourism), long before ecotourism with its focus on flora and fauna emerged in the early 1990s as the new driving force for nature-based tourism.

However, with its interests in raising public awareness in the geosciences, since 2021 the Australian Geoscience Council Inc (AGC) has been implementing a National Geotourism Strategy designed to support the orderly development of major geotourism projects, geosites, and activities in line with overseas trends and domestic regional development imperatives, all of which will provide a higher quality of tourism product for tourists and visitors. In 2024, the AGC rebranded its geotourism activities through a wholly owned entity to be known as Geotourism Australia.

In Australia, we have embraced the inclusive nature of the geotourism concept, as evidenced in long-standing ‘cave tourism’, and have understood the inter-relationship between natural and cultural heritage elements. By focusing on the geology and geomorphology as well as the ecology and culture arising from these geological characteristics, geotourism adds considerable content value to traditional nature-based tourism as well as to cultural tourism, inclusive of Aboriginal tourism. It emphasises an approach of increasing interest to managers of protected areas which include show caves and karst landscapes.

The National Geotourism Strategy has seven strategic goals. These span pathways for implementing major geotourism projects through the development of GeoRegions in Australia which can include karst landscapes, and the potential for geopark development in line with overseas exemplars. The development of a national digital platform (and, as it

relates to show caves and karst landscapes, including the use of augmented and virtual reality, 3D visualisation, and drones) to provide information for visitors wishing to interpret natural and cultural heritage features is also discussed. One of the goals provides guidelines for determining those geosites deemed suitable for geotourism and/or where access is restricted for cultural or heritage protection or for visitor safety reasons. In this context, the issue of the merits or otherwise of show cave lighting is highlighted.

The Strategy recognises that Aboriginal cultural elements and landscapes cut across widely accepted, post-settlement landforms (including show caves and karst landscapes), and have values specific to various groups and individuals. There is potential to incorporate and/or communicate (with permission or via collaboration) creation stories and narratives with astral knowledge of landscapes and features through geotourism.

A key goal is aimed at developing and enhancing the geoscience interpretation and communication skills of everyone actively involved, particularly tour guides, in the presentation of geosites (including caves and karst landscapes), enabling enthralling storytelling, which is accurate, educative, and enjoyable.

Introduction

Nature based tourism is a relatively young industry, but not so, cave tourism. Prior to the late 1960s, there was no substantive tourism industry in Australia per se as we now know it, just the travel and hospitality industries. Travel to outback attractions such as the then named Ayres Rock and the Flinders Ranges were restricted to the enthusiasts both local and overseas. Domestic travel around regional Australia, other than within coastal areas, were the province of commercial travellers. Ecotourism, as a concept, emerged in Australia in the early 1990s.

Geotourism is a relatively new concept in Australia but with cave tourism having been around for many years, noting the popularity of Jenolan Caves as a case in point to the extent that prior to WWII, Jenolan Caves was regarded overseas by international tourists in the same light that Uluru is today – a ‘must-see’ international tourism destination (Bourne et al. 2008).

Geotourism is now an established concept in many places around the world, especially Europe, North America, China, Indonesia, and other countries in the Asia Pacific region. Geotourism is defined by the US National Geographic Society (and updated by the Arouca declaration in 2011) as ‘tourism that sustains or enhances the distinctive geographical character of a place - its geology, environment, heritage, aesthetics, culture, and the well-being of its residents’. Importantly, geotourism is heavily endorsed by United Nations Educational, Scientific, and Cultural Organization (UNESCO) and supports a range of UNESCO Sustainable Development Goals (Bokova 2017).

In Australia, inspired by the success of the Inaugural International Geotourism conference held in Fremantle in 2008 (Dowling and Newsome 2008, Bourne et al. 2008), discussions at the 2010 Linnean Society of NSW Symposium in Port Macquarie recognised that geotourism, in addition to its primary role in promoting tourism to geosites, raised public awareness and appreciation of geodiversity. It was argued that geotourism fostered geoheritage conservation through appropriate sustainability measures and advanced sound geological understanding through interpretation (Robinson and Percival 2011). In establishing a Geotourism Subcommittee of its Geoheritage Standing Committee in late 2011 (later to be upgraded to a Standing Committee in its own right) the Geological Society of Australia (GSA) formally defined geotourism as ‘tourism which focuses on an area’s geology and landscape as the basis for providing visitor engagement, learning and enjoyment’. In recent years, the GSA amended this definition to refer to ‘sustainable geotourism’.

At the foundation of geotourism is the physical landscape, which shapes the geosystem services provided to the biota and human societies that live in the place. Geotourism is therefore integrated. It sees geology and landscape as the foundation bedrock around which society, culture, and ecosystems interact. As such, UNESCO recognises that geotourism can be practised in wild and protected places such as World Heritage Areas (e.g., Blue Mountains (inclusive of Jenolan Caves), Great Barrier Reef, Tasmanian Wilderness World Heritage Area), but also in areas with significant modification, and in UNESCO Geoparks.

In recent years, clear shifts in visitor behaviour have emerged (Robinson 2018), including growing demand for nature-based experiences including within caves, a preference for small-group and independent travel,

and increased visitation to destinations closer to home. These trends are accompanied by greater reliance on digital platforms for information and booking, alongside heightened interest from Australian governments at all levels in leveraging tourism to support regional employment and economic development.

Nature of Geotourism

In Australia, we have embraced the inclusive, ‘place-based’ nature of the geotourism concept and have understood the inter-relationship between natural and cultural heritage elements (Robinson 2010). By focusing on the geology and geomorphology (i.e., physical geography) as well as the ecology and culture arising from these geological characteristics, it is believed in Australia that geotourism adds considerable content value to traditional nature-based tourism as well as to cultural tourism, inclusive of Aboriginal tourism, thus completing the holistic embrace of ‘A’ (Abiotic) – non-living aspects such as the sky, climate, geology, landscape and landforms, speleology, water, and soils: celebrating geodiversity; ‘B’ (Biotic) – the living parts e.g., flora (plants) and fauna (animals): celebrating biodiversity; and ‘C’ (Cultural) – past and present, both Aboriginal and post European settlement (inclusive of mining), non-living and built (Robinson 2023).

Holistic Features of Cave/Karst Related Geotourism

By way of a broad summary of the various elements that need to be considered when discussing cave/karst landscape related geotourism, the following attributes are particularly relevant, given that a far more detailed analysis is provided by overseas workers in this field (e.g., Chiarini, Duckeck, and De Waele 2022). In addition, an Australian researcher has discussed the issue of climate change and the implications for geotourism and biodiversity conservation in the caves of southwest Western Australia, ever so more relevant now, 15 years later Eberhard (2010).

Abiotic

Caves and karst landscapes are defined by the dissolution of soluble rocks, primarily limestone, dolomite, and gypsum, by slightly acidic water, producing distinctive landforms such as sinkholes, shafts, underground rivers, and cave chambers. These systems are characterised by complex subsurface drainage, high rock porosity, and strong hydrological connectivity between surface and underground environments. Speleothems (e.g., stalactites,

stalagmites, and flowstones) record past climatic and hydrological conditions, while karst terrain reflects long-term interactions between geology, water, and climate. Together, these abiotic features form highly dynamic systems that underpin both ecological processes and human use, while preserving geological archives of deep time.

Biotic

Caves and karst landscapes support highly specialised and often endemic biotic communities adapted to darkness, stable temperatures, and low nutrient availability. These include cave-dwelling invertebrates, bats, microbes, and fungi, with surface/subsurface connections allowing energy transfer via water, roots, and organic inputs. Karst systems frequently function as biodiversity safe-havens and ecological corridors, making them ecologically significant despite their apparent simplicity.

The external surfaces of karst landscapes support diverse floral communities adapted to thin soils, high drainage, and microclimatic extremes. Vegetation often includes specialised drought-tolerant plants, lithophytes (i.e., plants that grow on bare rock) and endemic species restricted to limestone substrates, while surface karst features such as dolines, pavements, and tower karst create microhabitats that enhance biodiversity. These environments frequently function as ecological mosaics, linking surface ecosystems with subterranean systems through water, roots, and nutrient flows. Within these environments, endemic fauna species can be found and provide further opportunities for geotourism interpretation. For example, the Jenolan Karst Conservation Reserve is a wildlife sanctuary and home to many species of native plants and animals. Some of these are rare, threatened species such as the Brush-tailed rock-wallaby and Spotted-tailed Quoll.

Cultural

Caves and karst landscapes in Australia are embedded within layered cultural histories that extend from deep time Aboriginal relationships with Country to post-European settlement use and interpretation. These places record diverse cultural expressions, including Aboriginal landscape and astral knowledge systems ('Sky Country' as illustrated in Figure 1), early exploration routes, mining, and quarrying heritage (e.g., Wellington Caves in New South Wales), and the development of tourism and transport infrastructure. Together, these cultural layers reflect changing relationships between people and karst landscapes over time, providing a holistic context for understanding caves not only as geological systems but as lived and interpreted cultural places.

In understanding Aboriginal cultural landscapes and heritage, it is all about stories, the stories of place, the stories of people, the way we interact with that and the identities that are formed around it. It is not about the objects, it is about the relationship that Aboriginal people have with a place (land, waterways, sea, and sky). It is argued that the 'knowledge written in the land is written in the sky' (Noon and De Napoli 2022).

And yet with the emergence of Astro tourism in many destinations across Australia, tour operators are starting to realise that the presentation and interpretation using just Western scientific astronomical explanations of the night sky can be extensively enriched by inclusion of Aboriginal knowledge systems that inform and enrich all aspects of Aboriginal life, 'visibly refreshing traditions, culture and practices nightly', with seasonal variations. Unlike Western interpretations, the dreaming stories vary from place to place, with different songlines and wildlife species being portrayed in the sky. For example, many Aboriginal nations across Australia refer to the totem Dark Emu (or Celestial Emu) that can be seen just under the Southern Cross of the Milky Way.

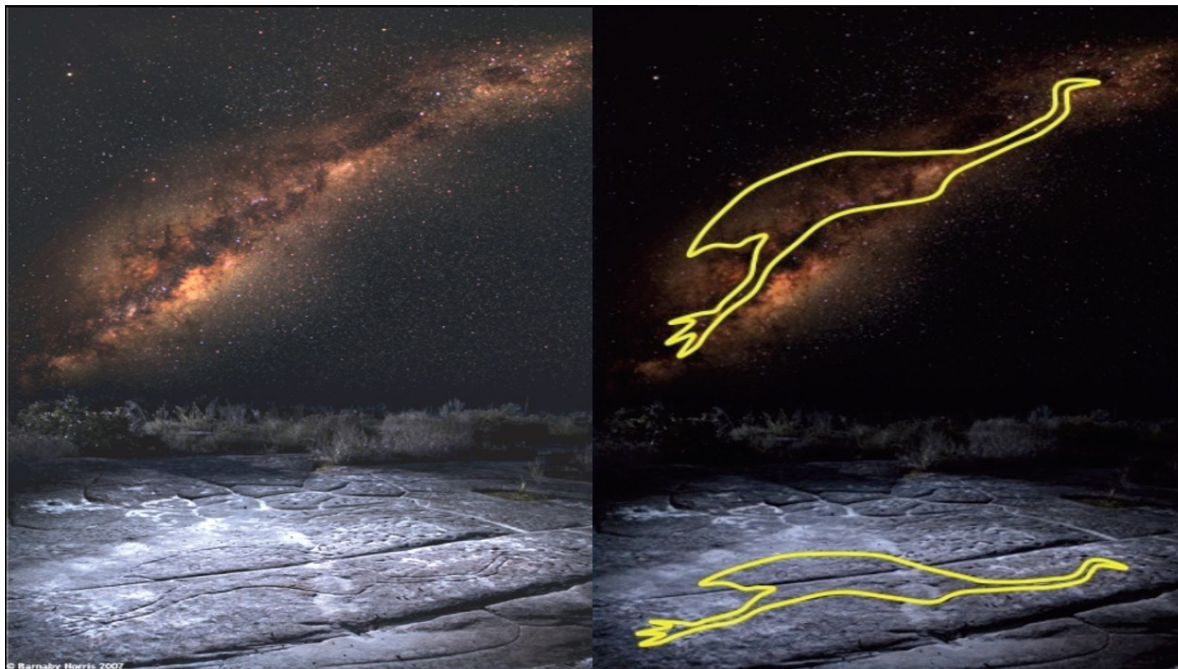


Figure 1: Left: traditional Astro tourism experience, generally the same scientific explanation at destinations across Australia at similar latitudes. Right: ‘Sky Country’ Astro tourism, with different stories to be explained depending on the Country where the viewing takes place across similar latitudes. Image courtesy of Ray Norris / Barnaby Norris.

In a broader context, Aboriginal knowledge systems across Australia understand landscapes as vertically connected realms linking Sky Country, Earth Country, and Under-Country, with caves functioning as cultural nodes within living story systems rather than isolated geosites (Rose 1996). Many songlines integrate terrestrial routes with celestial pathways, using stars and dark-cloud constellations to encode movement, law, and seasonal knowledge (Cairns and Harney 2003, Norris and Harney 2014). For geotourism, these relationships offer a framework for Aboriginal-led interpretation that connects caves to wider cultural landscapes and night skies, enriching visitor experience while reinforcing stewardship and respect for Country. Archaeological and ethnographic research confirms that such integrated narratives support place-based tourism that links geology, culture, and deep time (Taçon et al. 2012).

The Australian Government’s THRIVE 2030 Visitor Economy Strategy (Austrade 2025) and one of the key Actions (7.5) of this strategy is to ‘grow and develop high-quality products and experiences around unique Australian locations and themes, including approaches which integrate sustainable nature tourism with economic opportunities for Traditional Owners, and reflect emerging tourism trends such as geotourism’. Recognition of this proposition means that ‘Sky Country’ elements (inclusion of the plethora of considerations relating to Aboriginal knowledge systems) need to be incorporated into nature-based

tourism product where available, and that includes show cave experiences. The geotourism methodology using competent interpretation techniques offers the best way that this aspiration can be achieved.

Aboriginal Culture and Caves – Patterns in Cave Use

Across Australia, caves formed in limestone and volcanic landscapes have long played important roles in the cultural lives of Aboriginal peoples. Archaeological and ethnographic evidence demonstrates that caves were used for a range of interconnected purposes, reflecting their significance as places of shelter, ceremony, resource use, and cultural expression.

Caves with accessible entrances and stable microclimates were commonly used for shelter and habitation, particularly in karst regions with reliable ventilation and proximity to water. Many caves also functioned as ceremonial and spiritual places, linked to Dreaming narratives and ancestral beings, and continue to hold cultural significance today. Some caves were used for resource extraction, including the mining of ochre, chert, and other stone materials essential for tools, trade, and ritual use. Caves also preserve important records of artistic and symbolic expression, including engravings, hand stencils, and ochre paintings, which encode knowledge, law, and connection to Country. In some regions, limestone caves were used for burial practices, with human

remains intentionally placed as part of cultural traditions and spiritual beliefs (Spate 1997).

Together, these patterns of use highlight caves as multifunctional cultural landscapes, integral to Aboriginal relationships with Country and essential to understanding the cultural dimensions of cave and karst geoheritage.

Positioning of Geotourism in the Australian Context

Geotourism has links with adventure tourism, cultural tourism, ecotourism, wildlife tourism, Astro tourism, and agritourism, but is not synonymous with any of these forms of tourism, although in broad terms it embraces them all because it is essentially 'place based'.

Geotourism is undertaken in all natural areas, including places used by people (cultural tourism) and where primary industry activities (i.e., agriculture/agritourism, mining, and forestry) are prevalent, and in areas with Aboriginal land tenure or are the subject of cultural interest. It is therefore about the place, regardless of its condition.

Geotourism also emphasises an approach of increasing interest to protected area managers, particularly given the experience gained from the now discontinued Australian National Landscape Programme (Robinson 2022).

Geotourism and the Australian Geoscience Council Inc

Geoscience plays a significant role in exploring, understanding, and celebrating the connections between geological heritage and the broader natural, cultural, and intangible values of landscapes. Geotourism provides a powerful mechanism for translating this knowledge into public awareness, fostering deeper understanding of Earth processes while strengthening appreciation of geoheritage as a foundation for sustainable development.

This growing recognition has led to increased engagement by Geological Survey organisations and professional geoscience societies, the latter forming the constituency of the Australian Geoscience Council Inc. (AGC). Since 2018, the AGC has led the coordinated development of geotourism in Australia through its dedicated entity, Geotourism Australia. As the peak body representing approximately 8,000 Australian geoscientists, the AGC seeks to elevate the profile of geoscience within the broader community by supporting geoscience education in primary and secondary schools, and by engaging the public

through geotourism initiatives and other outreach activities. Through these efforts, geotourism is positioned as both a communication tool and a catalyst for strengthening the societal relevance of geoscience.

Additional Positioning Benefits of Geotourism

Beyond conservation and education, geotourism delivers a range of strategic co-benefits. It contributes to regional development, particularly in areas facing social and economic challenges, by attracting increased domestic and international visitation, an outcome of growing interest to local governments and State/Territory and regional development agencies. Geotourism also supports professional pathways for geoscientists through new roles in interpretation, research, and visitor engagement, aligning with the objectives of the AGC and its member societies.

Advances in information and communication technologies, including mobile applications, 3D visualisation, drones, and augmented and virtual reality, are expanding public access to geological information and enhancing visitor experiences, with increasing levels of interest by Geological Surveys and visitor centres.

Importantly, geotourism fosters broader public awareness of geology as a foundational science that has shaped human civilisation and will continue to influence future development. It also provides a platform for integrating geological heritage with natural, cultural, and intangible values, enabling more holistic understandings of place. These benefits are realised through visits to geosites, geotrails, caves, viewpoints, guided tours, and interpretive experiences, with geotourism now widely adopted as a sustainable development tool within geoparks, World Heritage areas, and emerging Australian GeoRegions.

Sustainable Geotourism

From a sustainability perspective, geotourism integrates themes from various sustainable tourism forms such as ecotourism, cultural tourism, agritourism etc., offering a comprehensive framework that benefits both travellers seeking authentic experiences and communities aiming to preserve their unique ways of life. This approach promises a more balanced, sustainable future for geotourism to all nature-based attractions, including caves and karst landscapes, by fostering respect for place, people, and environment.

Based on three accepted core principles, sustainable geotourism serves to minimise its negative impacts on the environment, society, and economy while ensuring the long-term preservation of resources for future generations. In this respect there is a focus on reducing harm and maintaining balance, conservation of geoheritage and cultural heritage, and supporting local communities through environmental sustainability, social equity (e.g., respecting local cultures), and economic viability (long-term profitability).

However, it should be considered whether a strengthened concept of ‘positive impact tourism’ (i.e., that which actively creates measurable benefits for the environment, local communities, and economies, going beyond simply minimising harm to actively doing good), can be applied to create new ‘value add’ for geotourism practice?

Based on these three suggested new core principles, the focus could then shift to generating net-positive outcomes, engaging in regenerative practices (such as restoring ecosystems), or directly funding social projects, and enhancing well-being for people by tangible contributions. These principles could include firstly actively contributing to environmental restoration, secondly empowering communities through education, infrastructure, or economic development, and thirdly by partnerships with local communities to achieve positive change.

In short, where sustainable tourism aims to minimise negative impacts, positive impact tourism aims to maximise positive contributions. Both concepts align in striving for responsible tourism, but positive impact tourism can build upon the foundation of sustainable geotourism by taking additional proactive steps to improve destinations and communities, particularly in Australia relating to First Nations peoples.

In consideration of these issues, the following definition of geotourism in Australia was approved in March 2026

“Geotourism is a place-based form of sustainable tourism that safeguards Earth’s geodiversity and geoheritage while strengthening interconnected biodiversity, cultural values, and the wellbeing of host communities. It achieves this through inclusive stewardship, meaningful interpretation, positive-impact practices and measurable outcomes that benefit people, place, and planet.” (Ng and Robinson 2026).

Evolution of the National Geotourism Strategy (NGS)

The AGC has identified a staged and incremental strategy as essential for securing government endorsement of geotourism initiatives at all levels. The National Geotourism Strategy (NGS) also recognises the need to protect the scientific and cultural sensitivity of geosites and to prevent inappropriate or unmanaged tourism. In 2020, the AGC established a NGS Reference Group comprising representatives from key stakeholder organisations, including the Geological Society of Australia and other professional bodies. Guided by this group, the NGS was launched in April 2021 (AGC 2021) with delivery shared across multiple stakeholder-led teams.

The strategy was designed to engage the broader community with geoscience, to respond to changing domestic tourism demand, to support rural and regional development, and to strengthen government support for geotourism through geoscience agencies. Implementation is now being advanced through seven strategic goals, overseen by a formal AGC Steering Committee chaired by Dr Jon Hronsky OAM.

NGS Goal 1: Digital Transformation

Development of new digital technologies to highlight and interpret natural and cultural heritage, highlighting geology and landscape, for a wide spectrum of visitors.

Technologies delivered through smartphones and in visitor interpretation centres (e.g., 3D visualisation, AR and VR) as a cost-effective means of better accessing, communicating/interpreting content for travellers. These innovative technologies are important considerations for all nature-based attractions including show caves. For example, the Zhijindong Cave UNESCO Global Geopark (Figures 3 and 4) has invested heavily in the application of these technologies.

A key outcome of Goal One has already made good progress. A digital platform prototype has been developed, known as the *Australian Geotourism Discovery Portal (AGDP)*. This platform serves as an information hub for various user personas, enabling them to discover and explore a wide range of attractions and destinations across Australia. The portal, using the University of Tasmania’s ArcGIS Hub Solution platform, boasts a user-friendly interface and easy navigation. Users can explore the platform by state or GeoRegion, and each geosite, geotrail, significant cave system location, mining site, or cultural site is accompanied by detailed descriptions, photos, and available amenities. This

allows travellers to gain a sense of what to expect before their visit.

The platform is being designed to be accessible through desktop and mobile browsers, ensuring that travellers can plan their trips conveniently while on the go. Furthermore, the platform can potentially integrate with other travel tools, such as booking and transportation services, to offer a seamless travel experience (Williams 2023).

NGS Goal 2: GeoRegions and Geoparks

To define an approval pathway for major geotourism projects (within which existing and new nature-based attractions could be either enhanced or established).

In 2018, following consultations with the national government geoscience agency, Geoscience Australia, it was recognised that a national approach, through the implementation of Goal Two, was needed to better manage major geotourism projects to maximise these indicative benefits and to take account of current perceived government and community group concerns.

It was recognised that the ‘highest order’ of sustainable geotourism can be accommodated through the establishment of geoparks, in the same way that World Heritage Areas and national parks might be seen as the highest order of protection and enjoyment for biodiversity, culture, and even geodiversity. Therefore, whilst the establishment of geoparks highlight one form of geotourism, they most definitely provide opportunities to celebrate and explore the Earth’s natural features whilst also incorporating culture, protections where appropriate, and sustainability in a way that is true to the core values of all nature-based tourism in Australia.

GeoRegions: A Framework for Integrating Geoheritage, Biodiversity and Community

The establishment of GeoRegions in Australia since 2018 has been redefining how geoheritage is identified, managed, and communicated. GeoRegions provide a practical, evidence-based framework for recognising geological significance, guiding land-use planning, and supporting long-term management, while enabling early and transparent engagement with local communities. Importantly, they also offer a constructive, low-conflict pathway toward potential UNESCO Global Geopark nominations.

As GeoRegions increasingly function as precursors to geoparks, an opportunity has emerged to integrate Key Geoheritage Areas (KGAs), including cave and karst landscape systems (Brilha et al. 2025) and potentially Key Biodiversity Areas (KBAs) into

regional planning. These internationally recognised designations, supported by the IUCN, highlight landscapes of exceptional scientific, ecological, and cultural value. Their inclusion could strengthen the GeoRegion framework, align Australian practice with international Geoconservation standards, and promote a more holistic approach to landscape assessment.

Recent experience learned from the Budj Bim Cultural Landscape (recently added to the UNESCO World Heritage list) demonstrates that early and genuine engagement with Aboriginal communities is essential to successful place-based heritage initiatives. Aboriginal knowledge systems and enduring cultural connections to Country deepen scientific understanding and enrich interpretation. Embedding cultural values from the outset ensures that geoheritage recognition reflects both deep time Earth processes and long-standing human relationships with land.

By integrating scientific evaluation, community participation, and Aboriginal cultural perspectives, GeoRegions function as platforms for conservation, education, and regional storytelling. They encourage visitors to experience landscapes not merely as scenery, but as dynamic places shaped by geological and cultural histories together.

UNESCO allows each nation to determine its own domestic processes for geopark assessment. In Australia, GeoRegions operate solely as a national preparatory mechanism. Should a GeoRegion progress to a formal geopark nomination with State or Territory government support, the GeoRegion designation could be superseded by the UNESCO framework.

Australian government geoscience agencies have formally endorsed GeoRegions as an essential exploratory step in geopark development, supported by approved national guidelines (AGC 2023a). A GeoRegion is defined as a geographically coherent area in which sites of geological significance are linked through a shared natural or cultural theme, using a bottom-up governance model that combines conservation objectives with sustainable development.

Implementation is supported through comprehensive stakeholder consultation, including Aboriginal communities, land managers, local governments, industry, and conservation groups. Proponents are encouraged to undertake early audits of natural and cultural heritage values and consult with relevant State and Territory Geological Surveys and planning agencies. This process helps focus effort, reduce land-

use conflicts, and identify areas suitable for geotourism development, including geotrails and cave-based experiences.

Two operational priorities now guide GeoRegion establishment:

1. an emphasis on identifying GeoRegions rather than geoparks, with early Geological Survey engagement; and
2. the development of geotrails (and where relevant, enhanced cave tours) as initial demonstration projects to build community and government support.

Three approved GeoRegions, Ku-ring-gai, Murchison, and Glen Innes Highlands now serve as national pilot studies. These initiatives have informed the development of administrative procedures for GeoRegions, regional geotrails, and future geoparks, providing a scalable model for integrated geoheritage conservation and sustainable regional development across Australia.

- Ku-ring-gai GeoRegion, a 440 sq km area contained within three Local Government Areas (Hornsby, Ku-ring-gai, and Northern Beaches) and protected areas including the national heritage-listed Ku-ring-gai Chase National Park, currently being developed around a series of geotrails www.kuringgaigeoregion.au (Conroy et al. 2022).
- Glen Innes Highlands GeoRegion, a 5,487 sq km area of New England managed by the Glen Innes Severn Council with several national parks and mining heritage areas. The Destination Management Plan is driven by geotourism principles and practices. <https://gleninneshighlands.com/files/geotourism-strategy.pdf>
- Murchison GeoRegion, located north of Perth, a 281,200 sq km area embraced by seven Shires, co-supported by the Mid West Development Commission, currently linked by a major regional geotrail <https://murchisongeoregion.com/>

Potential Karst Landscape GeoRegions of Australia

Given the opportunities offered through the GeoRegion establishment approach, it is suggested that consideration be given to establishing GeoRegions embracing significant cave and karst landscapes within Australia. These could include one or more of the following e.g., Nullarbor Plain,

Buchan/East Gippsland, the Jenolan–Wombeyan belt, Wellington limestone, Kangaroo Island and the Lower Murray and Limestone Coast regions of South Australia, and others in New South Wales i.e., Abercrombie, Ashford, Borenore, Bungonia, Cliefden, Cooleman Plain, Deua, Macleay, Timor, Wee Jasper, and Yarrangobilly Caves.

Geoparks

Geotourism attractions are now being developed around the world primarily as a sustainable development tool for the development of local and regional communities. A major vehicle for such development is through the concept of geoparks. A geopark is defined as a unified area with geological heritage of particular significance and where that heritage is being used to promote the sustainable development of the local communities who live there.

Unlike World Heritage Areas and national parks, geoparks can embrace both protected and any resource extraction areas, focusing on sustainable development objectives. Geoparks also focus on community engagement and ownership. In Australia, national parks generally focus primarily on biodiversity and often with insufficient attention given to geological heritage.

UNESCO designates three distinct programs - World Heritage, Man and the Biosphere, and Global Geoparks - to protect natural and cultural sites, foster biodiversity, and promote sustainable development (refer Figure 2). In Australia, only the World Heritage program is supported by government legislative arrangements.

UNESCO Global Geoparks are single, unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education, and sustainable development. Whilst World Heritage Areas and national parks are created in perpetuity, the status of global geoparks is reviewed by UNESCO every four years. (UNESCO 2021).

Whilst a geopark must demonstrate geological heritage of particular significance, the purpose of a geopark is to explore, develop and celebrate the links between that geological heritage and all other aspects of the area's natural, cultural, and intangible heritages. It is about reconnecting human society to all levels to the planet we all call home, and to celebrate how our planet and its 4,600-million-year long history has shaped every aspect of our lives and our societies.

Geoparks are both a regional development concept as well as a branding tool. They achieve these goals

through conservation, education and geotourism. Geoparks can comprise both protected and non-protected areas and enable and celebrate sustainable development of primary industries such as mining, agriculture, and forestry.

Whilst a UNESCO Global Geopark must demonstrate geological heritage of international significance, the purpose of a geopark (at all levels including national and local) is to explore, develop and celebrate the links between that geological heritage and all other aspects of the area’s natural, cultural, and intangible heritages.

A geopark uses its geological heritage, in connection with all other aspects of the area’s natural and cultural heritage, to enhance awareness and understanding of key issues facing society, such as using our earth’s

resources sustainably, mitigating the effects of climate change and reducing natural disasters and related risks. Geoparks (just like GeoRegions) give local people a sense of pride in their region and strengthen their identification with the area.

The UNESCO Global Geopark brand is a voluntary, quality label and while it is not a legislative designation, the key heritage sites within a geopark should be protected under local, regional, or national legislation as appropriate.

Notwithstanding the failure to obtain government approval for the Kanawinka Global Geopark established in 2008, there are currently no UNESCO Global Geoparks nor are there any government-approved geopark projects in Australia (Robinson 2023, Lewis 2023, and Turner 2013).

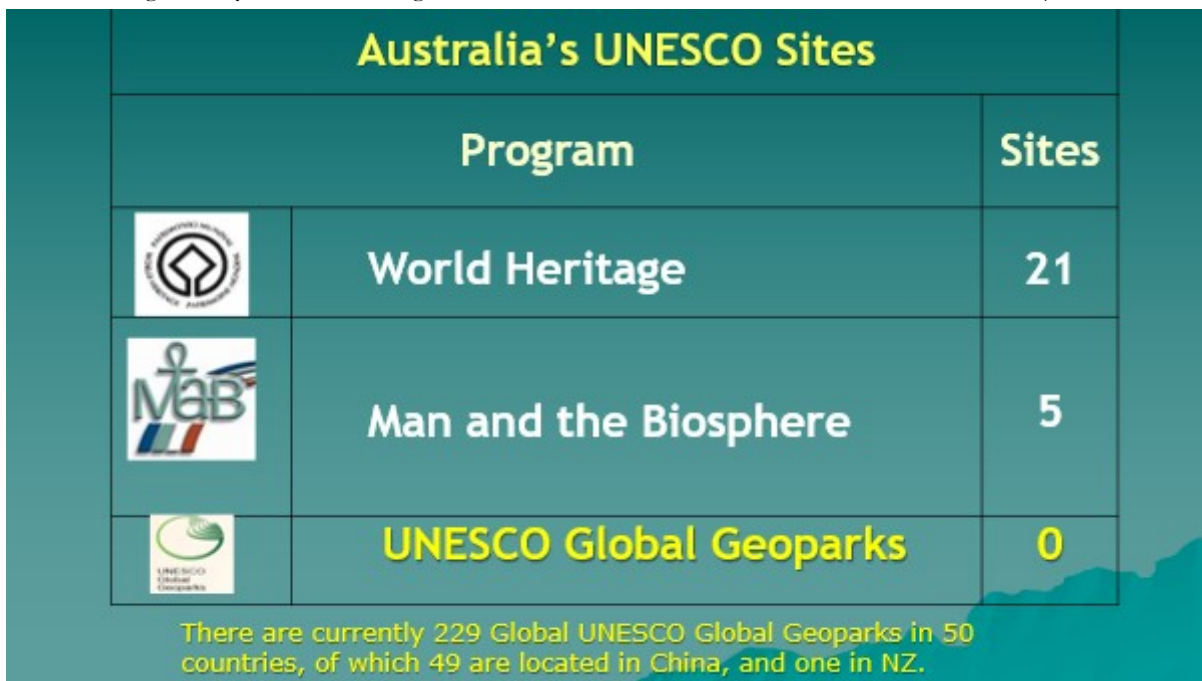


Figure 2: Australia's UNESCO Sites, 2025

UNESCO Global Geoparks featuring Caves and Karst Landscapes

Of the current 225 UNESCO Global Geoparks located in 50 countries, a number feature show caves and Karst landscapes. These include the following:

- Marble Arch Caves* UNESCO Global Geopark (UK/Northern Island).
- Maros Pangkep UNESCO Global Geopark (Indonesia).
- Famenne-Ardenne* UNESCO Global Geopark (Belgium).
- Swabian Alb UNESCO Global Geopark (Germany).
- Danyang* UNESCO Global Geopark (Republic of Korea).
- Gyeongbuk Donghaean* UNESCO Global Geopark (Republic of Korea).

In China, the following:

- Zhijindong Cave* UNESCO Global Geopark (Guizhou).
- Xingwen* UNESCO Global Geopark (Sichuan).
- Fangshan* UNESCO Global Geopark (Beijing).
- Enshi Grand Canyon–Tenglongdong Cave* UNESCO Global Geopark (Hubei).
- Leye-Fengshan UNESCO Global Geopark (Guangxi).
- Zhangjiajie* UNESCO Global Geopark (Hunan).
- Shilin* UNESCO Global Geopark (Yunnan).

* Show Cave and source: (Ng, Y., personal communication, 24 July 2025).



Figure 3: Show caves of the Zhijindong Cave UNESCO Global Geopark, Guizhou Province, China. Images courtesy of Dr Young Ng.



Figure 4: Show caves of the Zhijindong Cave UNESCO Global Geopark, Guizhou Province, China. Images courtesy of Dr Young Ng.

Australian Geopark Assessment Process

Australian Government Geoscience agencies have advised that while they support in principle the establishment of GeoRegions and geotrails, they are not able to collectively endorse the UNESCO Global Geoparks currently, but have subsequently agreed that individual jurisdictions with approved GeoRegions in place may decide to consider any geopark nomination proposal that might arise through a process (the Geopark Assessment Process) that has now been approved by the AGC following endorsement by these agencies (AGC 2025).

NGS Goal 3: Geotrails

To establish a framework for creating new geotrail development – local, regional, and national engagement to open dialogue with existing walking, biking, and rail trail interest groups and operators to highlight the availability of quality natural heritage information.

Goal Three aims to establish a framework for creating high quality, sustainable geotrails within Australia with an ‘Inventory of Geotrails for Australia’ documenting on the GSA website a considerable listing of projects. These geotrail projects comprise various geosites being connected into a journey linking geology and landscape destinations. They are being designed to have universal appeal with safe access, are easy to establish and represent a very cost-effective means of enhancing regional development (refer Figure 5). Working Group Three has released a set of guidelines for sustainable geotrail development (AGC 2024). These guidelines can be applied to geotrails constructed within the surface area of show caves or within karst landscapes.



Figure 5: Conjoint Associate Professor Ron Boyd, the University of Newcastle at the launch of the Port Macquarie Coastal Geotrail in May 2018, New South Wales. Image courtesy of Ivan Sajko, Port News.

NGS Goal 4: Geoheritage

To establish national criteria for geoheritage listings suitable for geotourism.

Goal Four seeks to establish nationally consistent criteria for identifying geoheritage sites suitable for geotourism. A major milestone toward this objective has been the publication of a national framework defining geoheritage sites, including caves and geosites within karst landscapes, which are appropriate for geotourism development (AGC 2023b). This framework provides a clear basis for linking geoheritage assessment with visitor experience, interpretation, and site management.

The associated Working Group is currently contributing data and specialist advice to the Australian Geoscience Data Platform (AGDP), a role expected to continue as the platform evolves. This engagement also highlights an emerging opportunity to expand the scope of Goal Four by developing a national approach to geoheritage management, reflecting the intrinsic connection between geotourism and long-term conservation outcomes.

Under the adopted framework, a geosite is considered suitable for geotourism where it clearly displays geodiversity values at a human scale, and presents an Earth history, process, or natural story that can be interpreted in accessible, non-technical language. Conversely, sites are excluded from geotourism consideration where they are highly sensitive to direct human impacts (e.g., trampling, collecting, or

vandalism); pose unacceptable safety risks; are located on private or restricted land without an existing tourism agreement; or are culturally sensitive, unless Traditional Custodians explicitly support their promotion for geotourism.

Together, these criteria ensure that geotourism development is selective, responsible, and aligned with both conservation and cultural protocols, providing a robust foundation for nationally consistent geoheritage practice.

NGS Goal 5: Cultural Landscapes

To develop geotourism in regional mining communities with potential geoheritage and cultural heritage sites.

Goal Five focuses on developing geotourism in regional mining communities with potential geoheritage and cultural heritage sites, where surfaces are exposed by mining, and their recreational, educational, and cultural values can be realised. Goal Five also aims to draw attention to these places, and to the range of activities that could be conducted in these places. It is understood that the acknowledgement of Aboriginal cultural heritage beyond the benefits offered through geotourism includes the need to ensure it is appropriately protected. It is believed that lessons learnt in this area by geotourism practitioners can be applied across landforms including show caves and karst landscapes. It is also hoped that geoscientists currently working in the mining sector and becoming familiar with the goals of the National Geotourism Strategy, will seek

out opportunities to apply their skills and capabilities in non-mining sectors such as show caves and karst landscapes.

NGS Goal 6: International Engagement

To strengthen Australia's international geoscience standing through geotourism excellence.

Through the implementation of Goal Six, a continuing focus on developing collaboration with geotourism interests in China and Indonesia and continuing involvement in various Global Geopark network activities needs to be accommodated, and these can include a focus on caves and karst landscapes.

Following visits to China by members of the GSA Geotourism Standing Committee, a Memorandum of Understanding between Zhijindong Cave UNESCO Global Geopark and Jenolan Cave Reserve Trust was executed by the parties in 2017 with a follow-up meeting organised by the Goal Six Working Group in 2025. Issues discussed (Ng, Y., personal communication, 24 July 2025) included management of geohazards, visitor education, ecological protection and wildlife research (particularly invertebrates, bats etc.), usage of digital technology, marketing, environmental monitoring, managing carrying capacity, safety management services, and cave lighting.

NGS Goal 7: Geocommunication and Interpretation

To develop and enhance the geoscience interpretation and communication skills of everyone actively involved in the presentation of geosites, enabling the provision of accurate and thematic information in an accessible manner.

Goal Seven will be advanced through coordinated investment in interpretive capacity-building, including the development of high-quality guidebooks, supporting documentation, and digital resources, alongside partnerships with professional guide networks such as Savannah Guides, the Institute for Australian Tour Guides, cave guides, and Aboriginal tour guides to strengthen training in place-based storytelling. The strategic use of emerging AI tools also offers new opportunities to deliver accurate, thematic, and audience-specific geoscience interpretation, enhancing accessibility while maintaining scientific and cultural integrity.

Conclusions

The growing adoption of geotourism thinking in Australia over the past two decades has created new opportunities to engage diverse audiences, particularly

domestic visitors, many of whom are familiar with show caves and karst attractions from countries of origin. Integrating biotic and cultural dimensions into cave-based geotourism significantly enhances visitor experience and adds interpretive depth to karst landscapes, strengthening their relevance beyond purely geological interest.

Engagement with the seven goals of the National Geotourism Strategy provides a clear pathway for expanding and enhancing show cave and karst landscape development across Australia, while encouraging deeper involvement from the geoscience community. In this context, speleological organisations and other interest groups are well placed to champion the establishment of GeoRegions, particularly as international frameworks such as the IUCN's Key Geoheritage Areas (KGAs) gain traction. KGAs, defined as areas containing geological features of global significance that record past or ongoing Earth processes, offer a complementary mechanism for strengthening Geoconservation, education, and public awareness.

Meaningful and early engagement with Aboriginal Traditional Owners and communities remains essential to ensure that cultural heritage, including connections to astral knowledge systems ('Sky Country'), is appropriately reflected in interpretation and storytelling, where culturally acceptable. The alignment between Action 7.5 of the Australian Government's Thrive 2030 Visitor Economy Strategy and the AGC's National Geotourism Strategy provides a timely opportunity to advance this objective through Aboriginal-led partnerships.

Finally, as show caves increasingly emerge as flagship geotourism destinations, managers are encouraged to incorporate positive-impact mechanisms within their development plans, including opportunities for visitors to contribute directly to conservation outcomes such as wildlife protection programs. Together, these approaches position Australia's cave and karst landscapes as exemplars of integrated geotourism that connects science, culture, community, and conservation.

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