

The IGMM Model: A Conceptual Consideration on Geoheritage Integrated Marketing and Management Approach for Geotourism Development

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Abstract

This paper presents the Integrated Geoheritage Management and Marketing (IGMM) Model. It is a framework designed to address the gap between geoconservation and tourism development. Geoheritage is a non-renewable resource that holds significant scientific value but often lacks public interest. To ensure its sustainable use, a coordinated approach is required. The IGMM Model considers management as the 'brain' and marketing as the 'voice' of this unified approach. Management focuses on supply-side security through scientific inventories, zoning, and monitoring. Marketing handles demand-side regulation through segmentation, storytelling, and branding. As a gentle regulatory tool, marketing helps practitioners identify suitable visitor segments and influence on-site behaviour through interpretive strategies. This reduces the need for strict physical measures.

Keywords

geoheritage management; geotourism development; marketing; integrated approach



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Introduction

Geoheritage is a part of natural heritage, reflecting the long-term development of the Earth, the geological structure of the territory, and the processes shaping the landscape (e.g., Brilha, 2016; Gray, 2013; Migoń & Pijet-Migoń, 2023). In recent decades, there has been a notable transformation in the perception of tourism, which increasingly emphasises sustainability, authenticity, and experiential exploration of landscapes (Bellato & Pollock, 2025; Breiby et al., 2020; Terkenli et al., 2021). This emerging trend fosters favourable conditions for the advancement of geotourism as a specialised form of tourism centred on the exploration of geoheritage and geodiversity features of the region (Dowling & Newsome, 2018; Gordon, 2018; Hose, 2012).

Within this framework, geoheritage is no longer regarded solely as an object of preservation but is recognised as a resource for regional development. However, despite its scientific, educational, and aesthetic value, geoheritage, in many cases, remains insufficiently integrated into development strategies and tourism offerings. The effective implementation of geoheritage and its values within a sustainable (geo)tourism product (Štrba et al., 2025) requires effective integration of geoheritage management and marketing. Such an integrated approach allows the management to ensure the authenticity and protection of geoheritage and its values, while marketing functions as a mechanism for regulation and interpretation.

Thus, the aim of this paper is to present conceptual considerations on the integrated marketing and management of geoheritage from the tourism perspective. By identifying the connections between these two disciplines, the paper presents a framework through which geoheritage long-term preservation is assured, alongside being a resource for regional development via tourism.

Theoretical framework

Research, study and utilisation of geoheritage, which is recognised as a natural resource for education and tourism, requires an interdisciplinary approach beyond the boundaries of a single scientific discipline. For its use in tourism, it requires integrating knowledge from geology, geomorphology, geography, environmental sciences, history, economics, management and marketing.

Generally, geoheritage can be defined as a collection of geological or geomorphological objects, phenomena, and processes that hold exceptional scientific, educational, aesthetic, or cultural-historical significance. This encompasses not only natural elements such as rocks, minerals, fossils, or landscapes, but also elements linked to human culture and history, such as historical mines, quarries or stone monuments (Brilha, 2016; IUGS, 2022; Kaur, 2022; Pijet-Migoń & Migoń, 2019). From the tourism perspective, it is crucial to recognise that geoheritage is not a static assemblage of objects, but rather, it constitutes a dynamic system of values whose importance varies based on the perception of its social, cultural, and economic context (Budjosó et al. 2015; Gordon 2018; Mikhailenko & Ruban 2019; Štrba et al. 2023, Tomić & Božić 2014).

Geoheritage is a subset of geodiversity. The term 'geodiversity' signifies a broader concept within which geoheritage can be systematically understood and evaluated. Geodiversity encompasses the natural variation of geological, geomorphological, soil, and hydrological elements and processes that shape the physical landscape. It includes rocks, minerals, fossils, relief, geological structures, soil types, as well as active and historical geological processes. Fundamentally, geodiversity represents an important aspect of natural diversity, on which biodiversity is based, although it is frequently less emphasised by society (Gray, 2008; 2011; 2013; Maliniemi et al., 2024; Tukiainen et al., 2022, Tukiainen & Toivanen, 2025).

Geoheritage can be understood as that portion of geodiversity that has been socially recognised and esteemed as exceptionally significant (Brilha, 2016). It includes elements of geodiversity that have considerable scientific, educational, aesthetic, or cultural-historical value and thus require conservation and targeted management. The formation of geoheritage is not automatic. Rather, it results from an assessment process (e.g., Brilha 2016; Bruschi et al., 2011; Kubalíková 2013; Pralong 2005; Reynard et al., 2007; Serrano & González-Trueba, 2005; Serrano et al., 2009; Suzuki & Takagi, 2018; Štrba et al., 2015; Tomić & Božić, 2014) in which the expert community identifies and determines geoheritage or elements of geodiversity of strategic importance.

In the context of tourism, geoheritage is recognised as a distinctive category of primary tourist resource, characterised by its intrinsic value derived from its visual appeal, uniqueness, authenticity, and regional importance (Gupta et al., 2024; Santangelo & Valente, 2020; Štrba et al., 2023; Zgłobicki et al., 2020). Unlike artificial attractions, geoheritage, in most cases, represents a result of long-term natural processes that are irreplaceable and immovable, making it vital for distinguishing tourist destinations (Zaferipoulos et al., 2021). This unique quality provides a strong foundation for tourism focused on such natural features, primarily geotourism.

So, geotourism is a special form of tourism that focuses on exploring geological and geomorphological phenomena and processes, with a strong emphasis on education, interpretation, and the conservation of the area. Geotourism goes beyond passive observation of natural features and aims at an interpretation and understanding and the relationship between humans and the environment (Dowling & Newsome, 2018; Hose, 1995; 2012; Ólafsdóttir & Tverijonaite, 2018). In this regard, it is classified as a form of sustainable tourism (Dowling, 2011),

minimising negative impacts on the environment and maximising benefits for local communities and nature protection (Liu, 2003; Streimikiene et al., 2021).

From a geotourism development perspective, many geoheritage locations (hereinafter geosites) are in peripheral or rural areas with limited economic bases or underdeveloped tourism infrastructure (Almeida & Machado, 2021; Kachniewska, 2015). In such areas, geoheritage can be a key catalyst for tourism development (Marjanović et al., 2022) through geotrails, educational trails, thematic exhibitions, or geoparks. Subsequent tourism growth can generate demand for complementary services, thereby supporting local businesses and employment (Farsani et al., 2011, 2013).

As different geoheritage values are distinguished, geotourism intersects with other forms of tourism, as noted by Newsome and Dowling (2010). Geoheritage is often located in areas of high landscape ecological value that are also attractive for recreation, hiking, spa treatments, and cultural or religious tourism (Figure 1). Thus, connecting geoheritage with history, culture, and ethnography enables the creation of comprehensive tourist products that enhance regional competitiveness and extend visitors' stays, reflecting the ABC concept of geotourism (Dowling, 2013; Pásková et al., 2021).

The relationship between geoheritage and geodiversity is significant not only for geotourism but for tourism in general. While the first encompasses specific sites and objects that serve as tourist attractions, the latter establishes a more comprehensive landscape framework that affects the area's character, visual appeal, and ecological stability (Gray, 2013). A high degree of geodiversity is frequently associated with high landscape aesthetic value and the potential for developing nature-oriented tourism activities (Chakraborty, 2022; Gray, 2013; Pereira et al., 2013).

The preservation of geodiversity requires a landscape-ecological approach that recognises spatial relationships, natural processes, and the territory's long-term evolution (Anderson et al., 2015; Gray, 2013; Nieto, 2024). By contrast, geoheritage management focuses on specific sites, where explicit regulations for protection, presentation, and utilisation can be established. For sustainable development and effective tourism promotion, these two approaches must be harmonised.

Management of geoheritage can be defined as a set of planning, organisational, and control activities aimed at its protection, conservation and sustainable utilisation (Reynard & Brilha, 2025). At a theoretical level, it is based on the principles of management of natural heritage and protected areas (Dudley, 2008; Kirkpatrick & Kiernan, 2012), emphasising long-term strategic planning, stakeholder participation, and the alignment of conservation and development objectives. In the context of tourism, management creates a framework that enables the use of geoheritage as a core component of the tourist product without compromising its nature and values (Štrba et al., 2025).

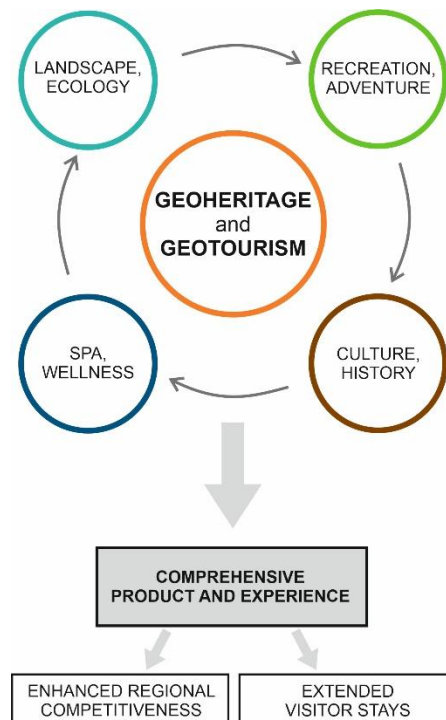


Fig. 1. Interdisciplinary and complementary nature of geoheritage in geotourism

Tourism marketing is generally understood as the process of identifying visitor needs and fulfilling them through the creation and dissemination of value (Fyall & Garrod, 2005). However, when applied to geoheritage, it takes on a unique character as it involves specific content that is not generally understood or appealing to the wider public. So, the marketing of geoheritage should predominantly be based on effective interpretation, communication, and promotion of experiences, through which the scientific significance is translated into recognition of its importance by the general public.

Hence, understanding geoheritage and its values, and effective geotourism development play a crucial role in education and in shaping environmental awareness (Dowling, 2011; Hose, 2012; Ólafsdóttir & Tverijonaite, 2018). Geosites serve as authentic environments for studying natural processes, landscape evolution, and the interaction between humans and natural resources. Via such locations, geotourism provides an informal education and fosters long-term shifts in public attitudes towards nature conservation (Hose, 2012; Macadam, 2018; Štrba & Palgutová, 2024).

However, geoheritage, as a developmental resource, has intrinsic limitations. An excessive influx of visitors or inadequate management can result in its degradation or damage (Carrión-Mero et al., 2025; Kubalíková & Balková, 2023). So, development of sustainable geotourism must be grounded in a comprehensive assessment of the area's carrying capacity and governed by clearly defined utilisation guidelines (Santos & Brilha, 2023). These considerations lead to the broader issue of geoheritage management, as broadly discussed, e.g., in Reynard and Brilha (2025), which is essential to its sustainable use.

Summarising the above mentioned, geoheritage can be considered a multidimensional resource for geotourism that integrates the environmental, economic, social, and cultural aspects of tourism. Its effective utilisation requires an integrated approach, in which development is conditioned by the protection of natural values and the active involvement of local stakeholders.

Methodology

This study employs a conceptual and analytical research methodology to develop an integrated framework for geoheritage management and marketing. Adopting a non-empirical approach, it combines literature synthesis and comparative conceptual analysis to construct a cohesive theoretical model (Jaakkola, 2020) implemented through three interconnected stages.

The initial phase included a review of the literature on geoheritage, geodiversity, geotourism, heritage management, and tourism marketing. Instead of undertaking a systematic bibliometric analysis or applying deep text mining techniques, the literature review uses a problem-oriented methodology to focus on the main concepts, theoretical gaps, and issues related to geoheritage management and marketing.

In the second phase, a comparative analysis examined how management and marketing tools are addressed across different geoheritage-related frameworks. This analysis focused on how existing approaches define resource limits, regulate visitor use and communicate value to target groups. The results of the analysis provided the basis for defining key components and relationships within the IGMM Model.

In the third stage, the IGMM Model was developed. Core management and marketing components were identified and interconnected, with a focus on their functional interdependencies and feedback mechanisms. The resulting framework conceptualises geotourism as a dynamic system in which management and marketing of geoheritage continually influence each other.

Framework for geoheritage management and marketing

The practical implementation of geoheritage protection and its subsequent use in tourism requires a stable institutional and organisational framework. Such a framework provides the necessary legal, financial, and personnel base for the long-term sustainability of the territory.

Geoparks represent the most complex institutional tool for the integrated management and marketing of geoheritage (Frey et al., 2006; Henriques & Brilha, 2017; Molokáč et al., 2024; UNESCO, 2026). A geopark is not merely a territory with geological value, but a functional platform that implements a 'bottom-up' approach to regional development (UNESCO, 2026). From a development perspective, geoparks must balance the protection of geoheritage with the socio-economic needs of the local residents.

Considering geoheritage use, the management of a geopark should focus on the inventory and monitoring of geosites, while the geopark's marketing activities should aim to create a unique regional brand. This synergy enables the transformation of 'raw' geological values into a structured tourism product that is competitive at the national and international levels.

While geoparks provide the strategic umbrella, the operational reality of geoheritage is centred on individual geosites - locations where geoheritage is accessible and holds high value (Brilha, 2025a).

The role of management at the geosite level is primarily technical and regulatory, ensuring that the site's existing values are not degraded by natural erosion or human impact (Carrión-Mero et al., 2025; Kubalíková & Balková, 2023).

Marketing's role at this level is based on the interpretation and translation of the geoscientific jargon into a narrative that is understandable to potential visitors, as proposed and discussed by various authors (e.g., Crofts 2024; Macadam, 2018; Macadam & Lacković, 2010; Migoñ, 2018; Štrba & Palgutová, 2024). However, before initiating any marketing activities, geoheritage management must determine its carrying capacity, as indicated above.

As a specific tool within this framework, geotrails serve as the physical link between management and marketing. A well-designed geotrail acts as a management tool by channelling visitors along a safe path, while simultaneously serving as a marketing tool through the placement of interpretive panels and educational stops (Stolz & Megerle, 2022; Palgutová et al., 2024). By strategically placing interpretive panels, management can transform a passive hike into an immersive learning experience that helps people appreciate natural heritage values.

Results and discussion

The synthesis of the discussed theoretical and institutional frameworks results in the development of the Integrated Geoheritage Management–Marketing (IGMM) Model. This section delineates the operational tools that constitute the core of this integrated approach.

Geoheritage management

Effective management of geoheritage is a fundamental prerequisite for its sustainable utilisation in the tourism sector (Brilha, 2025b; Ferdowski, 2025). This assumption is rooted in the fact that geosites are generally considered as non-renewable, meaning that any physical damage is often irreversible. Consequently, the development of geotourism cannot be viewed as a spontaneous or purely market-driven phenomenon. Instead, it must be approached as a purposeful, coordinated activity grounded in long-term strategic planning, rigorous regulation, and periodic revalidation (Hose, 2012; Newsome & Dowling, 2025). The first step of the management process involves the systematic identification and assessment of geosites (Brilha, 2016), utilising expert evaluation to assess their scientific, educational, and aesthetic significance against their inherent vulnerability. From a strategic perspective, this differentiation allows managers to distinguish between sites that support active public access and those that require restricted entry to preserve their scientific integrity.

Management strategy must be aligned with the regional and national legislative and institutional frameworks. In most countries, geoheritage protection is embedded within broader systems of nature and landscape protection, where individual sites have different degrees of legal status (Lukáč et al., 2021). However, for tourism development to succeed, these protective measures must be framed not as barriers to entry, but as the essential architecture that enables controlled and meaningful utilisation. This requires close cooperation among nature conservation authorities, local municipalities, and tourism stakeholders to ensure that management objectives align with regional development goals (Lukáč & Štrba, 2025). Central to this success is the active participation of local actors. By involving residents and local businesses, the societal acceptance of conservation is strengthened, transforming the community from passive observers into active co-creators of the regional development strategy.

Geoheritage management tools

The implementation of geoheritage management relies on a set of interconnected tools that align conservation with accessibility. Strategic and conceptual planning forms the basis of this system, creating management plans that set clear conservation objectives while outlining how the site will be integrated into the regional tourism offer (Leung et al., 2018). These plans are manifested through the protection and regulation system, which utilises spatial zoning to delineate core protected areas and active-use buffer zones. Such zoning is critical for channelling visitor flows and mitigating potential conflicts between conservation requirements and tourist activities.

These regulatory measures are complemented by the development of visitor infrastructure, such as geotrails, viewpoints and safety features. This infrastructure serves a dual purpose: (1) It significantly enhances the quality of the visitor experience and, at the same time, (2) acts as a preventive tool by guiding movement and protecting the heritage from physical degradation (Dowling & Newsome, 2017). Furthermore, educational programs and professional training for guides and local authorities ensure that the presentation of the site is at the expected level and comprehensible to the general public, fostering a sense of responsibility and co-ownership among those who interact with the geoheritage.

The final functional component of the management is the continuous monitoring and assessment of impacts. In the dynamic environment of the tourism sector, on-time adaptation is essential for long-term sustainability (Hartman, 2016; Schianetz & Kavanah, 2008). By regularly tracking site conditions, visitor numbers, and behavioural patterns, managers can identify negative trends early and adjust strategies. This data-driven approach enables fine-tuning of carrying capacities and infrastructure modifications before irreversible damage occurs.

Such management forms a resilient system that ensures geoheritage is protected and preserved while providing a stable foundation for targeted marketing activities.

Geoheritage marketing

The marketing of geoheritage (Frey et al., 2021; Norrish et al., 2014; Pijet-Migoń & Migoń, 2019; Ruban, 2021; Tiago et al., 2021) is a specialised domain of tourism marketing that focuses on natural values of high scientific importance but often lacks appeal to the general public. Rather than serving purely commercial interests, it should serve as a critical component of a broader system for sustainable tourism development. The primary objective of geoheritage marketing extends beyond merely increasing visitor numbers. It should be designed to address the following three aspects:

- Communicate the intrinsic importance of abiotic phenomena.
- Foster an emotional connection between visitors and the territory.
- Promote behaviours that align with nature conservation principles.

In this context, marketing serves as a translator, converting expert knowledge into comprehensible, engaging, and experiential products. Geoheritage itself is not a ready-made (geo)tourism product but a substantial component that requires strategic interpretation and effective communication (Štrba et al., 2025).

A fundamental principle in the marketing of geoheritage is the prioritisation of value over volume. Unlike mass tourism, which features extremely high visitor density, geoheritage marketing must focus on specific market segments receptive to learning and education (Habibi et al., 2023). This distinction is important because the appeal of geoheritage depends significantly on the visitor's level of interest and motivation (Allan, 2011; Drápela et al., 2021; Chylińska, 2019; Štrba, 2019; 2023). The target audience can be viewed as relatively broad. At one end are the experts and enthusiasts who emphasise professional accuracy and scientific authenticity. At the opposite end are experiential tourists primarily driven by visual appeal, landscape and cultural connections (Hose, 2016). Furthermore, families and school groups constitute an essential segment where marketing intersects with informal education.

Properly implemented segmentation plays a vital regulatory role within the designated territory (Dolincar, 2020; Kotler & Keller, 2013). By utilising specific language, targeted communication channels, and content rich in narrative, marketing acts as an intrinsic filter, attracting visitors with aligned interests while discouraging audiences seeking superficial or readily consumable experiences, such as those looking only for social media content (Hanna et al., 2018). This also shapes visitors' expectations before arrival. When marketing effectively communicates the site's protected status and emphasises the importance of respectful, meaningful visits, it can help regulate the area's carrying capacity and thus reduce the need for restrictive management measures.

The interpretation of geological heritage serves as an essential bridge between abstract scientific knowledge and visitors' experience. Without effective interpretation, geoheritage remains challenging to comprehend and emotionally detached (Crofts, 2024; Macadam, 2018). Consequently, successful promotion depends not only on the presence of geosites or geoheritage but also on the ability to communicate their importance through engaging stories. Storytelling can connect geoheritage with human experience and daily life and is an effective communication tool for inspiring any geotourism product (Henriques & dos Reis, 2021).

These narratives provide a clear logic that helps visitors 'read the landscape', significantly increasing the destination's memorability. Beyond the experiential benefit, interpretation plays a protective role. Visitors who understand the processes that created a site are more likely to respect conservation regimes (Macadam, 2018; Gordon, 2018). In this way, storytelling indirectly supports the physical integrity of geoheritage by modifying human behaviour through understanding rather than force (Bruno & Wallace, 2019). In the context of geoparks, these stories enable the creation of complex regional narratives in which geology is not an isolated layer (often scientific only) but a fundamental component of the territory's social and cultural identity.

Geoheritage branding

Building a brand for geoheritage or geoheritage territory is a strategic process where specialised natural values are transformed into a recognisable and sustainable long-term identity. Here, the brand is not merely a visual logo but a complex set of associations and expectations. Geoheritage should function as a 'deep brand' (Jenkinson, 2022), understood as an authentic foundation that is virtually impossible to imitate, giving the destination a permanent competitive advantage. While surface attractions can be manufactured, geoheritage phenomena provide a stable foundation for a regional identity, making the brand credible and stable.

A successful brand relies on integrating geosciences with the traditional economy, local architecture, and the local way of life. This holistic approach ensures that the brand is a lived experience rather than a marketing construct (Tsai, 2005). For peripheral or less well-known regions, a strong brand based on geoheritage can be a powerful tool for raising public awareness and competing with other destinations. Furthermore, it fosters internal identification among local residents (Zenker et al., 2017), strengthening their sense of pride and co-ownership. To

be effective, branding must be consistent across all communication tools, from on-site visual identities to digital presentations, ensuring that every visitor touchpoint conveys a unified story of the destination's values.

Integrated Geoheritage Management-Marketing Model

The major advantage of the proposed IGMM model does not lie in the isolated strength of its individual pillars (Figure 2) but in the functional synergy among them. Within the IGMM Model, management and marketing do not function independently. Instead, they are engaged in a continuous feedback loop wherein data from the supply side (management) informs the strategy of the demand side (marketing) (Figure 3). This integration serves as the primary mechanism to ensure that geoheritage remains a sustainable resource for development.

The IGMM Model suggests that, via interpretation and targeted segmentation, the same conservation goals can be achieved as through traditional regulatory and physical restrictive measures. When marketing initiatives identify and attract visitors motivated by educational and slow tourism, they naturally reduce pressure on the site's physical infrastructure. Additionally, effective storytelling can foster a sense of stewardship among visitors. By communicating the vulnerabilities and values of a geoheritage, marketing can influence visitor behaviour through increased understanding, thereby diminishing the necessity for aggressive physical enforcement.

Management serves as a key anchor for the brand. A destination's brand is only as strong as the authenticity and integrity of the experience it promises. Through specific measures, including monitoring, assessment and zoning, management ensures that the geoheritage, the 'deep brand' of the territory, remains protected and preserved. If management identifies a decline in site condition through its monitoring, this information must immediately trigger a change in the marketing strategy, resulting in the re-routing visitors to less vulnerable geotrails or sites. In this way, management acts as the quality-control mechanism that protects the long-term viability and credibility of the geotourism product.

The interaction between these pillars forms a robust territorial strategy in which:

- Management provides the 'limits of change': identifying how many people a site can handle, what they can do there, and what areas must remain untouched.
- Marketing delivers the 'value of communication': ensuring that the visitors who arrive are prepared, educated, and emphasising accuracy for professional audiences while engaging experiential tourists through narratives of various geoheritage values.

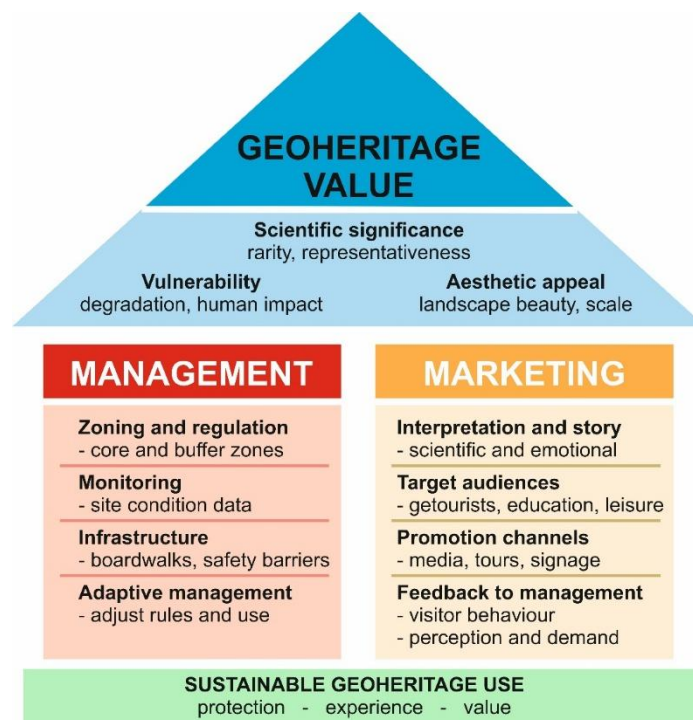


Fig. 2. Integrated Geoheritage Management-Marketing (IGMM) Model

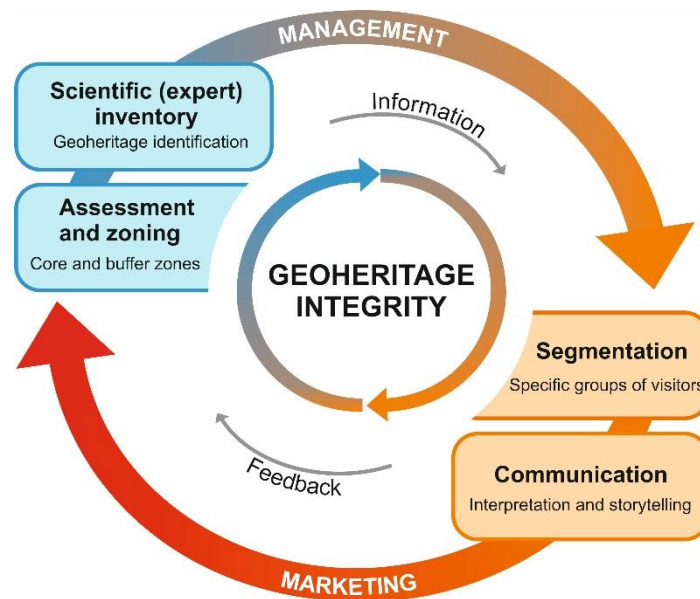


Fig. 3. The IGMM operational loop

This dual approach drives a balanced development model. It ensures that geoheritage is employed as a multifunctional instrument for education, regional identity, and sustainable economic growth. The IGMM Model provides a practical framework for professionals involved in geoheritage utilisation for tourism development, including staff of geoparks and protected areas, to advance beyond mere formal recognition and implement functional, sustainable operations.

The IGMM Model can be used as an audit instrument to evaluate existing geoheritage tourism systems. By assessing the relative robustness and coherence of management and marketing components, structural weaknesses can be identified and corrective actions prioritised. The diagnostic scenarios in Table 1 show how different management and marketing configurations affect geoheritage outcomes.

The framework assumes that management and marketing operate as a single unit, in which each supply-side finding triggers a specific demand-side response. For example, in the context of geosite vulnerability, such as increased erosion on a delicate fossil surface, the IGMM shifts away from solely reactive hard measures (Mason, 2005), such as total site closure. Instead, it suggests implementing a coordinated intervention in which management proposes installing a raised boardwalk to physically separate visitors from the vulnerable site, while the marketing simultaneously launches a targeted narrative, e.g., ‘slow geotourism’ or ‘above terrain’. By excluding the site from mass-market promotional listings and focusing on specialised educational segments, marketing serves as a pre-arrival filter that mitigates physical pressure without compromising the site's accessibility.

A similar integrated logic is applied when addressing the ‘hidden geoheritage’ common in peripheral areas. In these scenarios, exceptional geological features often lack spontaneous appeal because they have not been translated into a tourism product or attraction. Here, management provides the scientific inventory as a basis for defining the deep brand, such as the soil's unique mineral composition, while marketing develops a branding strategy that links this geological identity to local agricultural products, such as ‘volcanic wine’ or ‘mineral-rich honey’. This transformation ensures the geological feature is no longer an abstract scientific object but the authentic core of a regional product.

Table 1. Conceptual scenarios of (im)balance between geoheritage management and marketing within the IGMM Model and their implications for geoheritage conservation and tourism development

Challenge	Management intervention	Marketing intervention	Integrated outcome
Overcrowding	Implement seasonal zoning and physical barriers.	Use de-marketing for peak times; promote alternative sacrifice sites.	Balanced carrying capacity without total closure.
Vandalism/graffiti	Increase monitoring and physical safety features.	Use interpretive storytelling to explain the site's rarity and fragility.	Behavioural change through stewardship and education.
Lack of local support	Create participatory platforms for local actors.	Develop a regional deep brand that local businesses can adopt.	Strengthened community acceptance alongside increased local revenue
Low visitor interest	Ensure safe, high-quality infrastructure (trails/viewpoints).	Translate scientific data into emotional, narrative-driven storytelling.	High-quality experience that attracts "compatible" visitors.

The IGMM Model may also help to resolve institutional challenges, such as in the case of a geopark that holds formal status but lacks operational activity (‘paper geopark’) (Table 2). In this context, management concentrates on formalising the institutional framework and establishing conservation baselines, while marketing initiatives launch regional awareness campaigns to develop a visual identity. This synergy transforms the territory from a mere legal entity into a recognised regional destination.

Table 2. Management-marketing interventions based on the IGMM Model for optimising geoheritage tourism systems.

Challenge	Management intervention	Marketing intervention	Integrated outcome
Institutional inertia (e.g., ‘paper geopark’)	Formalise legislative frameworks and recruit specialised multi-disciplinary technical staff.	Develop a deep-brand and visual identity; launch regional awareness campaigns.	Transition from a nominal legal designation to a functional and recognised regional destination.
Socio-economic alienation (e.g., local hostility)	Implement participatory governance structures and ensure local access to managed zones.	Synthesise geo-features with local tangible heritage (e.g., volcanic viticulture, geoproducts).	Mitigation of conflict through tangible economic links (benefits) and regional pride.
Epistemological gap (e.g., scientific isolation)	Collaborate with experts to simplify data for public interpretation	Utilise interpretative storytelling and metaphors to facilitate interactive geo-experiences.	Transformation of abstract scientific data into an accessible, high-value tourism asset.
Geographic peripherality (e.g., regional disparity)	Expand the geotrail network to link remote sites with existing infrastructure.	Promote multi-day stays using digital apps and regional packages.	Optimisation of visitor length of stay and revenue for local stakeholders.

Furthermore, the model addresses the modern challenge of ‘Instagrammification’, in which visitors prioritise visual spectacles and taking photos for social media over appreciation and understanding (Araujo-Battle, 2023). To counter this, management installs subtle physical barriers or defines buffer zones to protect site integrity, while marketing shifts its communication from spectacle to process, explaining how the geosites evolved rather than just how it looks. This redirection of visitors' focus toward understanding and respect protects the site more effectively than any physical barrier alone.

Ultimately, the IGMM Model functions as a diagnostic instrument that enables managers to conduct a functional audit of their territorial strategy. By assessing the balance between the management and marketing, it can be precisely identified where the development model is underperforming. For instance, if a site is experiencing rapid physical deterioration despite having a management plan, this indicates either a failure in monitoring or a marketing strategy that attracts incompatible mass-market segments. Conversely, if the community perceives conservation efforts negatively, it suggests that management has been excessively top-down and that marketing has failed to create a brand that local residents feel they own and benefit from.

This diagnostic approach guarantees the continuous calibration of both management and marketing. It offers a strategic framework in which scientific inventory, zoning, and monitoring function as the ‘brain’ of the operation, while branding, storytelling, and segmentation serve as the ‘voice’ communicating with the public. Employing the IGMM model enables geoscientists, local actors, and tourism marketers to communicate in a common language, thereby ensuring that the provision of geoheritage resources and visitor demand are maintained in a monitored and sustainable equilibrium (Table 3).

Table 3. IGMM diagnostic framework for the identification of performance gaps

Focus	Audit question	Root cause	Recalibration strategy
Sustainability equilibrium	Are visitor numbers high but site conditions declining?	Strategic asymmetry: Marketing overperforms or targets incompatible ‘high-volume’ segments while management lacks regulatory infrastructure.	Strengthen ‘hard’ management (zoning/barriers) while deploying de-marketing strategies to filter for compatible visitor segments.
Social and scientific value	Is the site well-protected but unknown to the public or locals?	Translation failure: Management operates in strategic isolation; the marketing has failed to convert scientific data into social/emotional meaning.	Enhance interpretation and storytelling tools to bridge the gap between technical inventories and public appreciation.
Economic circularity	Is there high visitation but low local economic benefit?	Brand absence: The deep brand is missing. Marketing treats the site as a transient stopover rather than a regional socio-economic core.	Reconstruct the territorial identity by linking geoheritage to local ancillary products and services to ensure regional prosperity.
Institutional relevance	Is the site scientifically managed but politically and/or financially neglected?	Protectionist isolationism: Management views the public voice as a threat; the lack of marketing leads to a lack of perceived social value.	Transition from ‘hard’ conservation to softer models; use soft marketing to build political and community advocacy.
Conceptual integrity	Is the site popular, but visitors ignore its geoheritage significance?	Narrative dilution: Marketing has prioritised generic aesthetics over geoheritage substance, stripping the ‘product’ of its unique identity.	Re-introduce deep-branding and mandatory interpretative filters to ensure the ‘voice’ reflects the scientific ‘brain’.

Conclusion

The Integrated Geoheritage Management–Marketing (IGMM) Model presented in this study signifies a paradigm shift in the sustainable utilisation of geoheritage in tourism. The principal contribution of this research lies in conceptualising management and marketing as the central and expressive components of a unified system, wherein geoheritage management provides the strategic information and marketing functions serve as the communicative interface.

Based on the results presented, marketing can effectively serve as a soft regulatory tool. Through selective segmentation and effective communication, it filters compatible groups of visitors, thereby reducing the physical burden on geoheritage without the need for repressive physical measures. Conversely, management activities, including strict monitoring, evaluation and spatial planning, serve as a guarantee of the authenticity of the destination brand and ensure that the deep brand based on the geoheritage of the territory remains stable and competitive. This integrated approach is particularly important in addressing specific situations in which disruption of the feedback loop between supply and demand leads to stagnation.

For practitioners engaged in geoparks, protected areas, or regional development, research emphasises the significance of developing cohesive management plans and marketing strategies, rather than implementing them in isolation. There is a particular focus on translating scientific data into emotionally compelling narratives to influence visitors' on-site behaviour. A sustainable getourism region also necessitates the active involvement of local stakeholders to authentically represent the geo-identity through meaningful local products. Looking forward, this model advocates for further exploration of the digital realm, especially how real-time visitor data can facilitate the automation of marketing initiatives for sensitive sites. Ultimately, the IGMM Model aspires to preserve geoheritage not merely as a static natural feature but as a dynamic force that enhances regional prosperity. It balances the available geological resources with the community's desire to discover and enjoy them. The effectiveness of this framework relies on effective communication between scientific and technical teams responsible for management and the marketing and tourism personnel, ensuring continuous connectivity and alignment.

While the IGMM Model offers a theoretical framework for managerial-marketing measures harmonising geoconservation objectives with tourism development, its current conceptual foundation requires further empirical validation. The main limitation is the lack of real-world data to support the effectiveness of the IGMM Model. The model's applicability may vary across regions, e.g., where legal protections for geoheritage are insufficiently established or implemented. Furthermore, the framework emphasises marketing as a behavioural modifier. However, in cases of severe site vulnerability or rapidly increased number of tourists, these soft measures may be inadequate without the support of traditional hard management constraints and physical restrictions.

The IGMM Model functions as a normative theoretical framework, assuming a high degree of organisational synergy. In practical application, there is often a divergence between management and marketing key performance indicators. One example is the conflicts between reducing human impact and increasing the total number of visitors. It is evident that no conceptual model can fully resolve these structural tensions if the institutional goals remain bifurcated. To effectively implement the IGMM Model, it is essential to have not only a common understanding of the concept but also a formal alignment of institutional aims. This alignment is crucial for viewing geoconservation and tourism development as mutually enhancing, rather than competing, objectives.

To directly address these limitations, future research in this area should prioritise empirical validation of the IGMM theoretical model to confirm the hypothesised correlation between specific interpretive narratives and measurable changes in visitor behaviour or geosite integrity. To mitigate the risks of overreliance on soft measures, research is needed into how digital innovations such as big data analytics and geospatial AI can contribute to real-time monitoring to trigger immediate restrictive protocols when marketing filters fail to regulate visitor flow.

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