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Aspect of Uniqueness in Distinctiveness to the Development of Geotourism in Merek District

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ABSTRACT
This study analyzes the uniqueness of geodiversity, ecology, and culture as the foundation for sustainable geotourism development in Brand District, Karo Regency. Using a mixed methods approach (questionnaire N=100, interview n=6, observation), the results showed that the uniqueness of Brand's geodiversity lies in the volcanic phenomena of the Toba Caldera such as Sipiso-piso Waterfall (120 m) and Bukit Gajah Bobok which are rich in potassium and magnesium minerals. MANOVA's analysis showed a significant difference in the perception of tourists and the public towards geological uniqueness ($p<0.05$). Ecologically, volcanic soils with low total dissolved solids (TDS) (<150 ppm) support organic agriculture, although they are threatened by land conversion (25% reduced agricultural land) and plastic waste (volume decreased by 30% through the waste bank program). Local cultures such as Ulos weaving and the Erpangir Ku Lau ritual are identity differentiators, but their marketing is limited locally without certification. The integration of all three aspects requires technological innovation (augmented reality for geological interpretation), diversification of cultural products (craft training), and data-driven spatial planning policies. Strategic recommendations include strengthening community participation through Pokdarwis, a circular economy through recycling waste into handicrafts, and multi-stakeholder collaboration to make Brand a model of sustainable geotourism in Indonesia. This research emphasizes that the synergy of technological innovation, active community participation, and holistic policies are the keys to the success of geotourism development.
Keywords: Geotourism, Distinctiveness, Uniqueness, Merek District, Toba Caldera.

ABSTRAK
Penelitian ini menganalisis keunikan geodiversitas, ekologi, dan budaya sebagai pondasi pengembangan geowisata berkelanjutan di Kecamatan Merek, Kabupaten Karo. Menggunakan pendekatan mixed methods (kuesioner N=100, wawancara n=6, observasi), hasil menunjukkan bahwa keunikan geodiversitas Merek terletak pada fenomena vulkanik Kaldera Toba seperti Air Terjun Sipiso-piso (120 m) dan Bukit Gajah Bobok yang kaya mineral kalium dan magnesium. Analisis MANOVA menunjukkan perbedaan signifikan persepsi wisatawan dan masyarakat terhadap keunikan geologi ($p<0,05$). Secara ekologi, tanah vulkanik dengan total dissolved solids (TDS) rendah (<150 ppm) mendukung pertanian organik, meski terancam alih fungsi lahan (25% lahan pertanian berkurang) dan sampah plastik (volume turun 30% melalui program bank sampah). Budaya lokal seperti tenun Ulos dan ritual Erpangir Ku Lau menjadi pembeda identitas, namun pemasarannya terbatas secara lokal tanpa sertifikasi. Integrasi ketiga aspek memerlukan inovasi teknologi (augmented reality untuk interpretasi geologi), diversifikasi produk budaya (pelatihan

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kerajinan), dan kebijakan tata ruang berbasis data. Rekomendasi strategis meliputi penguatan partisipasi masyarakat melalui Pokdarwis, ekonomi sirkular melalui daur ulang sampah menjadi kerajinan, serta kolaborasi multipihak untuk menjadikan Merek sebagai model geowisata berkelanjutan di Indonesia. Penelitian ini menegaskan bahwa sinergi inovasi teknologi, partisipasi aktif masyarakat, dan kebijakan holistik menjadi kunci keberhasilan pengembangan geowisata.
Kata Kunci: Geowisata, Distinctiveness, Keunikan, Merek, Kaldera Toba.

1. Introduction

Tourism has become one of the strategic sectors in driving global economic growth, including in Indonesia (Öztürk, 2022; Rachmawati, 2021). This sector not only contributes to increasing regional income but also has the potential to improve community welfare through infrastructure development and cultural preservation (Utama, 2017; Lane & Kastenholz, 2015). In this context, geotourism has emerged as a promising trend because of its focus on the sustainable use of geological, ecological, and cultural heritage (Dowling & Newsome, 2017; Nafi'ah et al., 2022). Geotourism is defined as a tourism activity that integrates education, conservation (Ginting et al., 2020a), and local economic development through the exploration of unique geological features (Bolek et al., 2021; Nasir, 2023). This concept is increasingly relevant in Indonesia, which has 40 national geoparks and 4 UNESCO geoparks, such as the Toba Caldera (Ministry of Energy and Mineral Resources, 2022).

The success of geotourism development is highly dependent on the identification of a destination's distinctiveness. Distinctiveness refers to the distinctive characteristics that distinguish a place from others, whether in terms of geology, ecology, or culture (Youssef, 2023; Ozoliņa, 2021). According to Ginting & Wahid (2017), distinctiveness is the foundation of place identity that creates unforgettable experiences for visitors and strengthens the competitiveness of a destination. The four main principles of place identity are distinctiveness, continuity, self-esteem, and self-efficacy, indicating that uniqueness is a critical factor in attracting tourists (Azmi et al., 2021; Ginting et al., 2018). Unfortunately, many geotourism destinations in Indonesia fail to optimize this potential due to the lack of a holistic approach in integrating the three aspects of distinctiveness in geotourism (Brilha, 2002).

Merek District in Karo Regency, North Sumatra, is an example of an area with geotourism potential that has not been optimally developed. Destinations such as Sipiso-Piso Waterfall and Gajah Bobok Hill, which are included in the Sipiso Piso-Tongging Geosite in the UNESCO Toba Caldera Geopark, have unique geological features resulting from the volcanic activity of the Toba Supervolcano in ancient times (Muzambiq et al., 2023). However, data from the North Sumatra Tourism Office (2022) shows that tourist visits to Merek are only around 15,000 people per year, far below Lake Toba which reaches 2 million tourists. The decline in the number of visitors in recent years (Sitepu, 2018) indicates weak management of distinctiveness as the main attraction.

This problem is exacerbated by the lack of scientific narratives about geological processes in locations such as Sipiso-piso Waterfall and Gajah Bobok Hill, which were formed from the ancient eruption of the Toba Supervolcano, as well as the lack of integration of local culture such as the “Erpangir Ku Lau” ritual into tourist attractions (Harapan, 2021; Ginting & Lubis, 2020). In fact, studies at the Gunung Sewu Geopark (Prasetyo et al., 2023) and research by Gordon, et al. (2021) prove that distinctiveness packaging can increase visits by up to 300% through an educational approach and community participation.

This study aims to analyze the uniqueness aspect in distinctiveness of geotourism (geology, ecology, and culture) in Merek District and formulate a uniqueness-based geotourism development strategy. This study is important to optimize the potential of Merek geotourism, strengthen regional identity, and support environmental and social sustainability. The results are expected to be recommendations for policy makers in creating competitive and sustainable geotourism destinations.

1.1 Literature Review

Geotourism is a form of sustainable tourism that focuses on geological heritage (geodiversity), landscapes, and interactions with local cultures. This concept not only educates visitors about geological phenomena but also involves environmental conservation and community empowerment (Newsome & Dowling, 2018; Rickly, 2018). According to UNESCO (2020), geoparks as a geotourism container integrate three main

pillars: geology, ecology, and culture. Geological uniqueness such as geodiversity, geomorphological processes, and hydrology are the main attractions, such as the Gunung Sewu Geopark which combines limestone caves and community culture (Prasetyo et al., 2023).

Geotourism is built from three main elements:

a. Geodiversity is the diversity of geological features (rocks, minerals, fossils) and landscapes (Gray, 2013). For example, volcanic formations in Lake Toba that form a unique and scientifically valuable landscape (Ministry of Energy and Mineral Resources, 2022).
b. Ecology is the interaction between geology and flora, fauna, and ecosystems. Ecological preservation is important to maintain the uniqueness of a destination, such as in the Ciletuh Geopark which involves the community in conservation (Saputra, 2015).
c. Culture is local wisdom and community traditions related to the geological environment. For example, the rituals of the Karo people around Mount Sinabung that strengthen the geotourism identity (Liyushiana, 2023).

Distinctiveness is a critical aspect in geotourism development, because it determines the attractiveness and competitiveness of a destination (Truong et al., 2018). One of the most important aspects of Distinctiveness is uniqueness, which is a distinctive characteristic that distinguishes one location from another. For example, Lake Lau Kawar in Karo is a volcanic lake with an endemic ecosystem (Liyushiana, 2023).

Geological and cultural uniqueness must be integrated to create sustainable geotourism. Brilha (2018) emphasized that the success of geotourism depends on the community's ability to interpret geological and cultural heritage. In Merek, this potential can be seen from the combination of the volcanic landscape of Toba Supervolcano (Lake Toba Landscape), local wisdom, and the uniqueness of its natural landscape (Liyushiana, 2023).

Community participatory approaches are also important to strengthen uniqueness. Saputra (2015) gave the example of Ciletuh Geopark, where the community was involved as tour guides explaining geological processes and local legends. Similar strategies can be applied in Merek to increase the educational and economic value of geotourism.

Uniqueness in distinctiveness is the foundation of developing Brand geotourism. Integration of geodiversity, ecology, and local culture needs to be supported by community participation and sustainable policies. Thus, Brand geotourism is not only an educational destination but also contributes to environmental preservation and the local economy.

The uniqueness of a place is closely related to a positive view of its special characteristics and the activities that can be enjoyed at that location (Mantolas & Rero, 2020; Lalli, 1992; Hummon, 1990). Uniqueness includes activities, traditions, and distinctive elements that distinguish a place from other areas. According to Lalli (1992), uniqueness arises from comparisons between regions, where the characteristics of a location are recognized and appreciated by the local community. Factors such as the diversity of cultural activities, perceptions of cultural attractiveness (Ginting et al., 2014), and the diversity of local products are the main determinants of the uniqueness of a place (Elda et al., 2024; Ginting et al., 2017).

Ginting et al. (2017) emphasized that locations without specific characteristics or characters tend to be boring and easily forgotten. On the other hand, places that have competitive advantages and distinguishing characteristics will be more easily recognized and remembered (Ramdhani & Andriana, 2023). Therefore, uniqueness does not only depend on physical attributes, but also on cultural values, local activities, and typical products that are the identity of the place (Table 1).

Table 1. Uniqueness Elements

Reference	Element	Conclusion
Mantolas & Rero (2020); Lalli (1992); Hummon (1990) Lalli (1992)	● Special characteristics (physical/non-physical) ● Unique activities to do ● Positive public perception ● Comparison between places	● Diversity of unique activities ● Diversity of local products

Reference	Element	Conclusion
Elda et al. (2024); Ginting et al. (2017)	• Local community recognition/awards • Diversity of cultural activities • Perception of interesting cultural activities • Diversity of local products	• Unique traits/characteristics (physical or non-physical)
Ginting et al. (2017)	• Unique traits/characteristics (physical or non-physical)	
Ramdhani & Andriana (2023)	• Competitive advantage • Distinguishing characteristics • Distinctive identity (cultural values, activities, local products)	

Source: Author's Analysis, 2025

So the Strengthening Factors of Uniqueness in geotourism are as follows:

- Diversity of typical activities (Mantolas & Rero, 2020; Lalli, 1992; Hummon, 1990), such as cultural rituals or natural attractions.
- Diversity of local products (Elda et al., 2024; Ginting et al., 2017), such as handicrafts or culinary specialties.
- Unique characteristics/characteristics (Ginting et al., 2017), both physical (landscape, architecture) and non-physical (traditions, folklore).

Thus, the uniqueness of a place is built from the dynamic interaction between physical attributes, cultural activities, local products, and community perceptions, which together form a sustainable identity and attraction.

2. Method

This study uses a mixed methods approach with a convergent parallel design to examine the uniqueness aspect in distinctiveness in geotourism development in Merek District. This approach combines quantitative (questionnaire) and qualitative (interview, observation) data simultaneously to obtain a holistic understanding (Creswell & Plano Clark, 2018; Ginting et al., 2020). Data integration is carried out through methodological triangulation to validate findings and enrich interpretations (Flick, 2018).

The research was conducted in Merek District, Karo Regency, North Sumatra (Figure 1), focusing on two geotourism destinations, namely Sipiso-piso Waterfall (volcanic geosite of the Toba Caldera) and Gajah Bobok Hill (a volcanic rock landscape with a panorama of Lake Toba). The selection of locations was based on geodiversity potential, cultural uniqueness, and relevance to sustainable geotourism development strategies (Sitanggang & Sugiarti, 2020; Manurung & Sinabariba, 2021). The research period was from March to June 2025.

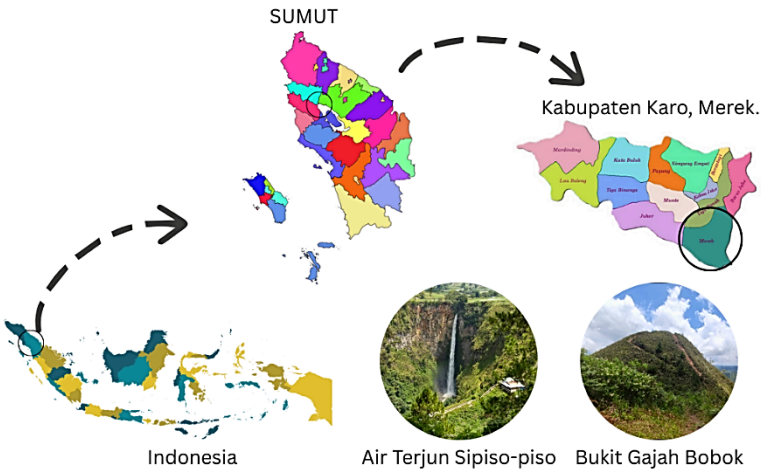

Figure 1. Research Location
Source: Google, Author, 2025

This research variable focuses on the uniqueness aspect in the distinctiveness of geotourism, which is described in the following sub variables:

- Geodiversity: Vertical landmarks (volcanic cliffs, waterfalls), iconic landforms, and geological uniqueness (Ginting et al., 2017).
- Ecology: The relationship between physical characteristics of nature (hills, rivers) with biodiversity and conservation efforts (Phetsuriya & Heath, 2021).
- Culture: Community participation in maintaining traditions (eg, Erpangir Ku Lau) and the use of cultural motifs (eg, Gorga Batak) (Ginting & Wahid, 2016).

The population in this study were visitors and local communities in Merek District. With a sample for quantitative data of 100 local community respondents and domestic/international tourists, selected by accidental sampling (Machali, 2021). Then qualitative data (in-depth interviews) of 6 key informants (government, tourism managers, tourists, local communities), selected through purposive sampling based on knowledge relevance (Sugiyono, 2017).

The data collection method in this study was obtained in 3 ways, namely distributing structured questionnaires with a Likert scale to measure the perception of uniqueness (instrument validation through Pearson's validity test and Cronbach's Alpha reliability> 0.7) (Mantolas & Rero, 2020). Then conducting semi-structured interviews with open-ended questions about the role of culture in strengthening distinctiveness (Flick, 2018). Finally, by conducting participatory observations, namely visual documentation (photos) and field notes related to the physical conditions of the geosite, community activities, and tourism infrastructure (Creswell, 2014).

Data analysis in this study with quantitative data, namely conducting descriptive statistical tests (mean, standard deviation) and inferential (MANOVA) using SPSS 26 to analyze differences in perception based on demographics (Machali, 2021). Then the qualitative data was analyzed thematically by identifying patterns such as "uniqueness as a driver of community participation" (Braun & Clarke, 2006 in Flick, 2018).

Integration of quantitative and qualitative outcome data was compared to test for consistency (eg, high scores on geological uniqueness supported by interviews about community pride in volcanic heritage) (Creswell & Plano Clark, 2018).

3. Discussion

3.1 Uniqueness of Geodiversity

Merek District highlights the uniqueness of geodiversity through geological phenomena such as Sipiso-piso Waterfall and Gajah Bobok Hill. Sipiso-piso Waterfall, with a height of 120 meters, is the result of volcanic activity of the Toba Caldera which formed andesite rock cliffs (Chesner, 2012). This uniqueness is not only a visual attraction but also an educational medium about geological processes, as explained by Hose (2012) that geological interpretation through information boards can improve visitors' understanding. However, observations show that the information boards at the location are less interactive, so technological innovations such as augmented reality (AR) are needed to strengthen the uniqueness of geological education (Martínez-Graña et al., 2023).

Gajah Bobok Hill also offers unique geomorphology in the form of fertile volcanic soil rich in minerals such as potassium (K) and magnesium (Mg), supporting organic farming (Soil Research Institute, 2020). However, the conversion of agricultural land into settlements (Bappeda Karo, 2022) threatens the sustainability of the ecosystem. This is in line with the research of Ginting et al. (2020) which emphasizes that the uniqueness of geotourism must be integrated with sustainable spatial planning.

3.2 Uniqueness in its Ecology

The ecological uniqueness of Merek District can be seen from the interaction between natural resources and human activities. The springs around Sipiso-piso Waterfall Flow (Figure 2) and Gajah Bobok Hill, for example, not only support the community's living needs but also organic farming. The volcanic soil in this area has low total dissolved solids (TDS), improving the quality of agricultural products (Soil Research Institute, 2020). However, the transition to sustainable agriculture is hampered by the lack of product certification and market access (Nugraha & Muhammad, 2023).

Figure 2. Sipiso-piso Waterfall Flow
Source: Author, 2025

On the other hand, waste management is an ecological challenge. Although the Karo DLH (2023) recorded a 30% decrease in the volume of plastic waste, tourist participation in maintaining cleanliness is still low, trash is scattered around Gajah Bobok Hill (Figure 3). Programs such as "waste banks" and appeals based on local myths (e.g., a ban on littering due to belief in the "Waterfall Guardian") need to be strengthened with formal regulations (Ginting, 2020). Circular economic strategies, such as recycling waste into craft products, can be a solution (Silvandi & Mandalia, 2022).

Figure 3. Garbage Scattered on Gajah Bobok Hill
Source: Author, 2025

3.3 Uniqueness of its Culture

Cultural aspects, such as Ulos weaving (Figure 4) and traditional festivals, are the distinctiveness of the Brand geotourism. Ulos motifs depicting nature and local legends are not only art products but also symbols of Karo cultural identity (Ginting & Wahid, 2016). Interview results show that community pride in Ulos increases participation in heritage preservation (Annisa et al., 2022; Fadli & Aulia, 2019). However, marketing of this product is still limited to the local market, and the lack of certification hinders international market penetration (Nugraha & Muhammad, 2023).

Figure 4. Ulos Weaving
Source: Author, 2025

Cultural festivals such as Sipaha Lima in Tongging Village are also unique because they combine traditional rituals with natural beauty (Figure 5). Unfortunately, this activity has not been formally integrated into tourism packages (Sitanggang & Sugiarti, 2020). This indicates that cultural distinctiveness needs to be supported by collaboration between the government and tourism actors to optimize economic potential (Prasetyo et al., 2023).

Figure 5. Sipaha Lima Tongging People's Party
Source: HarianSIB.com

3.4 Integration of the Three Aspects of Uniqueness
The uniqueness of geodiversity, ecology, and culture in Merek District are interrelated in forming the distinctiveness of geotourism. For example, the fertile volcanic soil in Gajah Bobok Hill not only supports agriculture but also forms the basis of local myths that strengthen cultural identity (Ginting et al., 2018). This integration is in line with the geopark concept which emphasizes the relationship between geological heritage, biodiversity, and culture (UNESCO, 2020).

However, the main challenge is the low level of community participation in geotourism management. Only 15% of homestays offer cultural packages, such as craft demonstrations (Ramdhani & Andriana, 2023). Therefore, development strategies must involve collaborative approaches, such as:

- Educational Enhancement: Integrating AR into information boards to enhance tourist engagement (Martínez-Graña et al., 2023).
- Diversification of Cultural Products: Integrating Ulos motifs and traditional rituals into tourism packages through community training (Ginting et al., 2018).
- Community-Based Management: Increasing the role of Pokdarwis in developing cultural content, such as in the Gunung Sewu Geopark (Prasetyo et al., 2023).

These findings confirm that the geological, ecological, and cultural uniqueness of Merek District has great potential as a geotourism distinctiveness. However, the sustainability of development depends on the synergy between technological innovation, community participation, and data-based policies (Ministry of Energy and Mineral Resources, 2022).

The development of geotourism in Merek District requires practical implications and integrated policies to ensure sustainability and optimal utilization of geodiversity, ecology, and cultural potential. One key policy is strengthening formal regulations regarding the protection of geological areas, as mandated in the sustainable spatial planning. For instance, the implementation of special zoning for landslide-prone areas around Bukit Gajah Bobok can reduce the risk of environmental degradation due to land-use change. From an economic perspective, the development of certifications for organic agricultural products and Ulos weaving needs to be supported by local government policies to open access to international markets. Collaboration with financial institutions to facilitate circular economy programs, such as recycling waste into economically valuable crafts, is also a priority.

The potential for the expansion of geotourism is not limited to the Merek District but can be developed in other areas in Karo Regency or geopark regions in Indonesia. As a reference, the Kebumen Geopark, which has been designated by UNESCO as a global geopark, demonstrates the success of integrating geodiversity, culture, and local economy through collaborative strategies among the government, academics, and the community. A similar model can be applied in Parigi or Sekayam Districts, which have unique geological characteristics and ecosystems based on data from the Geological Agency. (Fajar, 2024; Yunianto et al.,

2024).

However, this expansion requires supporting infrastructure, such as geoconservation laboratories and technology-based educational facilities, as developed in Karangsambung. The policy of human resource development through community training in geodiversity-based tourism management is also crucial to ensure active community participation in geotourism management. With a holistic approach between technological innovation, regulation, and area expansion, Merek District can become a geotourism model that not only preserves local identity but also provides long-term economic and ecological benefits.

4. Conclusion

This research comprehensively analyzes the uniqueness of geodiversity, ecology, and culture in the Merek District as a foundation for the development of sustainable geotourism. The findings indicate that geological uniqueness, such as the Sipiso-piso Waterfall (120 m) and the mineral-rich Gajah Bobok Hill with potassium and magnesium, has significant educational potential. However, the limitations of this study lie in the lack of in-depth evaluation of the effectiveness of implementing interactive technologies (e.g., Augmented Reality) in enhancing tourists' geological understanding, as well as the suboptimal quantitative data regarding the direct economic impacts of the proposed circular economy program.

Ecologically, fertile volcanic soil supports organic farming, but it is threatened by land conversion (25% of agricultural land has decreased) and plastic waste issues (the volume of plastic waste has decreased by 30% through waste bank programs, but tourist participation remains low). Cultural uniqueness, such as Ulos weaving, the Sipaha Lima festival, and the Erpangir Ku Lau ritual, serves as a strong identity differentiator, although its marketing is still limited locally without official certification. This research also has limitations in specifically measuring the impact of community participation on increased tourist visits and the sustainability of cultural programs.

The integration of these three aspects is crucial, yet the sustainability of geotourism in Merek Subdistrict largely depends on the synergy between technological innovation, active community participation, and holistic policies. The direction of further research needs to detail the following aspects:

- Study on the Effectiveness of Interactive Technology: Conduct experimental research to measure the increase in geological understanding and tourist satisfaction after the implementation of Augmented Reality (AR) on information boards at Sipiso-piso Waterfall and Bukit Gajah Bobok. Data can be collected through pre-post intervention surveys and analysis of visitor interaction duration with the technology.
- Analysis of Circular Economy Impact: Conducting a feasibility study and economic impact assessment of a recycling program that transforms waste into handicrafts, including value chain analysis, market potential, and contributions to local community income. This may involve case studies on existing artisan groups or economic simulations for proposed scenarios.
- Development of Cultural Product Certification Model: Designing and testing a certification model for Ulos woven products and cultural tourism packages (such as the Erpangir Ku Lau ritual) that meet national and international standards. This research may include comparative studies with other destinations that have successfully certified local products.
- Evaluation of Community Participation and Policy: Further analyzing the driving and hindering factors of community participation in geotourism management, as well as evaluating the effectiveness of existing spatial planning policies and environmental protection regulations. This could include a comparative policy analysis with other geoparks in Indonesia (for example, Kebumen Geopark) that have demonstrated success in integrating geodiversity, culture, and the local economy.

Thus, further research that is more specific and data-driven will strengthen the strategy for sustainable geotourism development in the Merek District, making it a more robust model for geotourism development in Indonesia.

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References

Annisa, Y., Karangan, R., Haryani, T., & Hikmah, N. (2022). Potensi Air Terjun Danggang Sapaya Sebagai Objek Geowisata Kabupaten Gowa, Sulawesi Selatan. JURNAL TEKNIK GEOLOGI: Jurnal Ilmu Pengetahuan dan Teknologi, 5(1), 24-31.

Azmi, N. F., Ahmad, F., & Ali, A. S. (2021). Identifying place distinctiveness through cultural resource mapping. Journal of Regional and City Planning, 32(2), 179-95.

Balai Penelitian Tanah. (2020). Peta Kesuburan Tanah Kabupaten Karo. Kementerian Pertanian RI.

Bappeda Karo. (2022). Laporan PDRB Kecamatan Merek 2022.

Bolek, S., Szreter, A., Rożek, A., & Galka, E. (2021). The Geotourism Students' Scientific Club and 18 years of its activity at AGH University of Science and Technology. Geotourism/Geoturystyka.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Brilha, J. (2002). Geoconservation and protected areas. Environmental conservation, 29(3), 273-276.

Brilha, J. (2018). Geoheritage and geoparks. In Geoheritage (pp. 323-335). Elsevier.

Chesner, C. A. (2012). The Toba Caldera Complex. Quaternary International, 258, 5–18. https://doi.org/10.1016/j.quaint

Creswell, J. W. (2014). Research design: Qualitative, quantitative, and mixed methods approaches (4th ed.). Sage.

Creswell, J. W., & Plano Clark, V. L. (2018). Designing and conducting mixed methods research (3rd ed.). Sage.

DLH Karo. (2023). Laporan Pengelolaan Sampah 2023. Dinas Lingkungan Hidup Kabupaten Karo.

Dowling, R. K., & Newsome, D. (2017). Geotourism Destinations – Visitor Impacts and Site Management Considerations. Czech Journal of Tourism, 6(2), 111–129. https://doi.org/10.1515/cjot-2017-0006

Elda, S. W., Mihardja, E. J., & Agustini, P. M. (2024). Strategi Branding Pariwisata Berkelanjutan Geosite Tabiang Takuruang Di Sumatera Barat. IKRA-ITH HUMANIORA: Jurnal Sosial dan Humaniora, 8(1), 409-424.

Fajar, J. (2024, June 16). Perjalanan Panjang Kebumen Menjadi Geopark Global Unesco Tinggal Selangkah Lagi. Mongabay.co.id. https://mongabay.co.id/2024/06/16/perjalanan-panjang-kebumen-menjadi-geopark-global-unesco-tinggal-selangkah-lagi/

Flick, U. (2018). The SAGE Handbook of Qualitative Data Collection. SAGE Publications Ltd. https://doi.org/10.4135/9781526416070

Ginting, N., Zahrah, W., Hamzah, A., Mohamed, B., Trombadores, A., & Damanik, U. (2024). PRESERVING CULTURAL HERITAGE: A CASE STUDY OF CULTURAL TOURISM SUSTAINABILITY DEVELOPMENT IN GIRSANG SIPANGAN BOLON, INDONESIA. Geo Journal of Tourism and Geosites, 56(4), 1551-1563.

Fadli, R., & Aulia, D. N. (2019, May). Pelestarian Permukiman Tradisonal Batak Toba di Kawasan Ekowisata Tano Ponggol. In Talenta Conference Series: Energy and Engineering (EE) (Vol. 2, No. 1).

Ginting, N., Marpaung, B. O. Y., Sinaga, F. A., Narisa, N., & Siregar, N. (2020, April). Geotourism and stakeholders: An approach to enhance geoconservation. In IOP Conference Series: Earth and Environmental Science (Vol. 452, No. 1, p. 012156). IOP Publishing.

Ginting N., Rahman N. V., Subhilhar S., Wahid J. (2018), The Role of Place Identity in Planning Heritage Tourism, The Indonesian Journal of Planning and Development 3 (2), 56-66.

Ginting, N. & Wahid, J. (2016). Defining Distinctiveness Aspect of Place Identity in Urban Heritage Tourism. 8th International Conference on Architecture Research and Design (AR+DC). 8.

Ginting, N., & Lubis, H. (2020). Perencanaan Tata Guna Lahan Dalam Mendukung Pengembangan Desa Wisata Tongging yang Berkelanjutan. In Talenta Conference Series: Energy and Engineering (EE) (Vol. 3, No. 1).

Ginting, N., & Wahid, J. (2017). Defining Distinctiveness Aspect of Place Identity in Urban Heritage Tourism. IPTEK Journal of Proceedings Series, 3(3).

Ginting, N., ES, R. A. P., Salsabilla, A., & Lathersia, R. (2020). Keterkaitan antara Aspek Lingkungan pada Pariwisata Berkelanjutan terhadap Distinctiveness (Studi Kasus Kawasan Geopark Kaldera Toba). In Talenta Conference Series: Energy and Engineering (EE) (Vol. 3, No. 1).

Ginting, N., Lathersia, R., Putri, R. A., Yazib, P. A. D., & Salsabilla, A. (2020). Kajian Teoritis: Pariwisata Berkelanjutan berdasarkan Distinctiveness. In Talenta Conference Series: Energy and Engineering (EE) (Vol. 3, No. 1).

Ginting, N., Nasution, A. D., & Rahman, N. V. (2017). More attractive more identified: Distinctiveness in embedding place identity. Procedia Environmental Sciences, 37, 408-419.

Ginting, N., Rahman, N. V., & Nasution, A. D. (2018). Distinctiveness, Continuity, Self-Esteem, & Self-Efficacy in Tourism of Karo Regency, Indonesia.

Gordon, J. E., Crofts, R., Gray, M., & Tormey, D. (2021). Including Geoconservation in The Management of Protected and Conserved Areas Matters for All of Nature and People. International Journal of Geoheritage and Parks, 9(3), 323-334.

Gray, M. (2013). Geodiversity: Valuing and Conserving Abiotic Nature. John Wiley & Sons.

Harapan, M. (2021). Potensi Danau Lau Kawar dalam Geowisata. Medan Bisnis Daily.

Hose, T. A. (2012). 3G's for Modern Geotourism. Geoheritage, 4(1-2), 7–24. https://doi.org/10.1007/s12371-011-0052-y

Hummon, D. M. (1992). Community attachment: Local sentiment and sense of place. In Place attachment (pp. 253-278). Boston, MA: Springer US.

Kementerian ESDM. (2022). Panduan Geopark Indonesia.

Kementerian ESDM. (2022). Panduan Pengembangan Geopark Indonesia. Kementerian Energi dan Sumber Daya Mineral Republik Indonesia.

Lalli, M. (1992). Urban-Related Identity: Theory, Measurement, And Empirical Findings. Journal of Environmental Psychology. 12, pp. 285–303.

Lane, B., & Kastenholz, E. (2015). Rural Tourism: The Evolution of Practice and Research Approaches–Towards A New Generation Concept?. Journal of Sustainable tourism, 23(8-9), 1133-1156.

Liyushiana, L. (2023). Model Pengembangan Wisata Bencana Berbasis Kearifan Lokal (Kasus di Kabupaten Karo, Sumatera Utara) (Doctoral dissertation, Universitas Sumatera Utara).

Machali, I. (2021). Metode penelitian kuantitatif (panduan praktis merencanakan, melaksanakan, dan analisis dalam penelitian kuantitatif).

Mantolas, C., & Rero, L. S. (2020). Persepsi Wisatawan Domestik Terhadap Kualitas Objek dan Daya Tarik Pantai Manikin di Kabupaten Kupang. TOURISM: Jurnal Travel, Hospitality, Culture, Destination, and MICE, 3(2), 104-111.

Manurung, H., & Sinabariba, E. (2021). Indonesia Soft Power: Toba Caldera as UNESCO Global Geopark 2020. Sociae Polites, 22(2), 173-186.

Martínez-Graña, A., González-Delgado, J. A., Nieto, C., Villalba, V., & Cabero, T. (2023). Geodiversity and Geoheritage to Promote Geotourism Using Augmented Reality and 3D Virtual Flights in the Arosa Estuary (NW Spain). Land, 12(5), 1068.

Muzambiq, S., Nst, Z. P., & Sabrina, R. (2023). Geotourism as a 16-Geosite Empowerment Strategy - For Tourism Sustainability in Toba Caldera Geopark. Journal of Geographic Information System, 15(2), 294-307.

Nafi'ah, U., Habib, M. A. F., Fathurozi, R., & Sari, R. W. (2022). A Bibliometric Review of The Development of Geotourism Research in The Last Five Years. International Journal of Geotourism Science and Development, 2(2), 40-46.

Nasir, S. (2023). Geotourism in the Sultanate of Oman: Samail Ophiolite Geosites–A Concept of Sustainable Geotourism. In Geotourism in the Middle East (pp. 135-157). Cham: Springer International Publishing.

Newsome, D., & Dowling, R. (2018). Geoheritage and Geotourism. In Geoheritage (pp. 305-321). Elsevier.

Nugraha, W. A., & Muhammad, W. N. (2023). Konsep Berburu Batu Akik Sebagai Geowisata Berbasis Edukasi Geologi Di Desa Sawahan, Kecamatan Ponjong, Kabupaten Gunungkidul. Jurnal Teknik Geologi: Jurnal Ilmu Pengetahuan dan Teknologi, 5(2), 1-6.

Ozoliņa, L. (2021). A Study of Place and Identity: The Main Features of Distinctive Place Brand Identity. Culture Crossroads, 17(1), 42-56.

Öztürk, E. (2022). The Effects of Tourism: Economic, Environmental, Social, Cultural, Social Psychological. In Routledge Handbook of Social Psychology of Tourism (pp. 31-44). Routledge.

Phetsuriya, N., & Heath, T. (2021). Defining The Distinctiveness of Urban Heritage Identity: Chiang Mai old city, Thailand. Social Sciences, 10(3), 101.

Prasetyo, A. H., Widiyanto, N., & Soeroso, A. (2023). Pengembangan Geowisata Berbasis Partisipasi Masyarakat Di Kawasan Geopark Gunung Sewu Gunungkidul. ULIL ALBAB: Jurnal Ilmiah Multidisiplin, 2(7), 2749-2763.

Rachmawati, E. (2021). Pemberdayaan Masyarakat Dalam Pengembangan Wisata. Syiah Kuala University Press.

Ramdhani, A. M., & Andriana, A. N. (2023). Strategi Pengembangan Daya Tarik Wisata Pantai Biru Kersik Dalam Meningkatkan Minat Kunjungan Wisatawan Menggunakan Analisis SWOT. Management Studies and Entrepreneurship Journal (MSEJ), 4(5), 6674-6687.

Rickly, J. M. (2018). Tourism Geographies and The Place of Authenticity. Tourism Geographies, 20(4), 733-736.

Saputra, I. M. (2015). Pengembangan Geopark Ciletuh Berbasis Partisipasi Masyarakat Sebagai Kawasan Geowisata di Kabupaten Sukabumi (Doctoral dissertation, Universitas Pendidikan Indonesia).

Silvandi, G. O., & Mandalia, S. (2022). Pengembangan Taman Margasatwa dan Budaya Kinantan dengan Menerapkan Aspek Pariwisata 3S (Something to see, something to do, something to buy). i-Tourism: Jurnal Pariwisata Syariah, 1(2), 70-81.

Sitanggang, L., & Sugiarti, D. (2020). Partisipasi Masyarakat Lokal Dalam Pengelolaan Daya Tarik Wisata Air Terjun Sipiso-piso Kabupaten Karo, Sumatera Utara. JURNAL DESTINASI PARIWISATA, 8(2), 238 - 245. doi:10.24843/JDEPAR.2020.v08.i02.p11

Sitepu, D. R. (2018). Pelaksanaan Program Pengembangan Objek Wisata Air Terjun Sipiso-piso Oleh Dinas Kebudayaan dan Pariwisata Kabupaten Karo.

Sugiyono. (2017). Metode Penelitian Kombinasi (Mixed Methods). Bandung: Alfabeta

Truong, T. L. H., Lenglet, F., & Mothe, C. (2018). Destination Distinctiveness: Concept, Measurement, And Impact on Tourist Satisfaction. Journal of Destination Marketing & Management, 8, 214–231. https://doi.org/10.1016/j.jdmm.2017.04.004

UNESCO. (2020). UNESCO Global Geoparks: Celebrating Earth heritage, sustaining local communities. Paris: UNESCO Publishing.

UNESCO. (2020). What is a Global Geopark? United Nations Educational, Scientific and Cultural Organization.

Utama, I. G. B. R. (2017). Pemasaran Pariwisata. Penerbit Andi.

Youssef, R. S. (2023). Place and The (Trans) Formation of Self-Identity in Ezzedine Fishere's Farah's Story. GeoJournal, 88(3), 3093-3104.

Yunianto, B., Ansori, C., Samodra, H., Suseno, T., Permanadewi, S., Hartono, H., Suherman, I., Sugiarti, S., & Cahyaningtyas, D. (2024). Capitalizing on Geopark Master Plan in Pursuing Sustainable Development Goals: Case Study of the Kebumen Aspiring UNESCO Global Geopark, Kebumen, Indonesia. https://doi.org/10.2139/ssrn.4675479