Article

Understanding Geotourist Characteristics: A Quantitative Study of Motivations and Typologies in Kalisuci Geosite, Gunungkidul, Yogyakarta

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ABSTRACT

Kalisuci Geosite within the Gunung Sewu UNESCO Global Geopark attracts fewer visitors compared to other sites such as Nglanggeran, suggesting that current promotional efforts have not effectively reached the intended tourist segments. This study identifies tourist typologies and motivations at Kalisuci and examines their associations with sociodemographic characteristics. Data were collected from 120 respondents using closed-ended questionnaires administered through accidental sampling and analyzed using descriptive statistics, cross-tabulation, and Chi-Square tests ($\alpha = 0.05$) with Cramér's V. The predominant typologies identified were Adventurer (45.0%) and Escape-Seeker (34.2%), while Culture Enthusiast (14.2%) and Learner (6.7%) represent potential niche markets. Motivation was mixed: 53.3% of respondents were primarily intrinsically motivated and 46.7% extrinsically motivated, although the mean extrinsic motivation score was slightly higher (4.11 vs. 4.00). Dominant typology was significantly associated with age ($\chi^2 = 28.28$; $p = 0.005$) and occupation ($\chi^2 = 28.56$; $p = 0.005$), with weak-to-moderate strength (Cramér's $V = 0.28$), whereas motivation showed no significant association with sociodemographic variables. The combined typology–motivation approach demonstrates that mean intensity and individual-level classification can yield different dominant categories. These findings provide an empirical basis for segment-specific marketing strategies, such as targeting students with adventure-oriented products and private-sector workers with escape-focused packages.

Keywords: Geotourism; Tourist Typology; Tourist Motivation; Destination Management; Market Segmentation.

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ABSTRAK

Geosite Kalisuci bagian dari Geopark Global UNESCO Gunung Sewu menarik lebih sedikit pengunjung dibandingkan dengan geosite lain seperti Nglanggeran, yang mengindikasikan upaya promosi yang dilakukan belum efektif menjangkau segmen wisatawan yang dituju. Penelitian ini bertujuan untuk mengidentifikasi tipologi dan motivasi wisatawan di Geosite Kalisuci, Gunungkidul serta menguji hubungannya dengan karakteristik sosio-demografis. Sebanyak 120 responden diambil dengan *accidental sampling* menggunakan kuesioner tertutup, lalu dianalisis dengan statistik deskriptif, tabulasi silang, serta uji Chi-Square dan Cramér's V. Berdasarkan skor tertinggi setiap responden, tipologi dominan adalah Petualang (45%) dan Pencari Ketenangan (34,2%), diikuti Penggemar Budaya (14,2%) dan Pembelajar (6,7%) yang menjadi ceruk pasar potensial untuk diversifikasi produk wisata. Motivasi bersifat campuran dengan dominasi motivasi intrinsik (53,3%) dan motivasi ekstrinsik (46,7%), meskipun rata-rata skor motivasi ekstrinsik sedikit lebih tinggi (4,11 vs 4,00). Tipologi dominan berhubungan signifikan dengan usia ($\chi^2 = 28{,}28$; $p = 0{,}005$) dan pekerjaan ($\chi^2 = 28{,}56$; $p = 0{,}005$) dengan kekuatan lemah hingga sedang (Cramér's $V = 0{,}28$), sedangkan motivasi tidak berhubungan dengan karakteristik sosio-demografis mana pun. Penelitian ini memberikan kontribusi berupa pendekatan gabungan tipologi–motivasi yang belum pernah diterapkan di Kalisuci dan menunjukkan bahwa rata-rata skor serta klasifikasi individual dapat menghasilkan kategori dominan yang berbeda. Temuan ini menjadi dasar strategi pemasaran per segmen: pelajar/mahasiswa untuk produk petualangan dan pekerja swasta untuk paket pelepas penat.

Kata Kunci: Geowisata; Tipologi Wisatawan; Motivasi Wisatawan; Manajemen Destinasi; Segmentasi Pasar.

1. Introduction

A geopark is defined as an integrated geographical area in which sites of international geological significance are managed according to three core pillars: conservation, education, and sustainable development (Du & Girault, 2018). Geoparks are intrinsically connected to geotourism, a sector that has expanded rapidly in recent decades. Geotourism, as a form of nature-based tourism, aims to promote visitation to geological sites, preserve geological diversity, and enhance public understanding of Earth sciences through appreciation and educational activities (Wang et al., 2019). These objectives are pursued through self-guided site visits, geological trails, guided tours, and other geological activities (R. K. Dowling, 2011). Geotourism functions both as a tourism modality and as a catalyst for geological conservation, with the capacity to support sustainable economic development at the local scale (R. Dowling & Newsome, 2010; Thomas A Hose, 2011). It has been identified as an effective instrument for geological conservation and rural development, particularly in environmentally sensitive regions (Ólafsdóttir & Dowling, 2014). The diversity of geotourism activities generates a wide range of tourist profiles with complex and multidimensional motivations. For site managers, balancing the goals of increasing visitor numbers and operational efficiency with the imperative to protect geological heritage remains a central operational challenge (Cahyadi & Newsome, 2021; Ferdowsi & Németh, 2026). Comprehensive knowledge of tourist typologies and motivations is essential for the effective development, management, and long-term sustainability of geotourism destinations.

Kalisuci, recognized by the UNESCO Global Geoparks Network, offers a distinctive caving-tubing experience that integrates cave exploration with underground river rafting. Despite its considerable geotourism potential, Kalisuci has yet to attract significant tourist numbers (Purwanto et al., 2020). Kalisuci imposes a daily visitor limit of 250 (Sutarmi, 2017), however, actual attendance averages only 5 to 10 visitors per day, increasing to approximately 50 visitors per day on weekends (Raja, 2023). In contrast, other geosites such as the Nglanggeran Geosite attract up to 500 local tourists daily (Kurniawan, 2023). This comparison does not serve as a

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direct benchmark. Both geosites are located within the Gunung Sewu UNESCO Global Geopark; however, they differ in geological type, the nature of tourism products offered, and the maturity of their promotional efforts (Bere et al., 2026; Pramesti et al., 2025; Tripujiantari et al., 2024). Nglanggeran demonstrates the level of demand that a more widely recognized geosite within the same geopark can attract. In contrast, the distinct characteristics of Kalisuci indicate the need for a segment-specific approach rather than a mass-market strategy. This disparity indicates that the development and promotion of Kalisuci have not effectively reached tourists whose interests align with its attractions. To maximize the potential and diversity of geotourism activities in Kalisuci, comprehensive research on suitable market segmentation is required. Effective planning and management of geotourism destinations necessitate identifying target tourist profiles and their motivations for visiting. A thorough understanding of tourist motivations and typologies enables managers to implement targeted marketing strategies to attract specific segments (Chingombe & Taru, 2018; Perera et al., 2012). Additionally, such understanding facilitates the provision of tailored services, thereby enhancing the visitor experience (Muliawan et al., 2024; Widyawan & Hehanussa, 2024). Fung & Jim (2015) contend that addressing the specific needs and motivations of diverse tourist types can increase visitor satisfaction and foster sustainable tourism practices.

Previous research on tourism at Kalisuci has primarily focused on supply-side factors, including the diversification of tourist attractions (Monika & Prakoso, 2023; Prabawa, et al., 2024), the area's carrying capacity (Februadha & Kiat, 2024), and development strategies (Prabawa, et al., 2024). While one study P. Purwanto et al. (2020) addressed demand-side aspects (marketing mix and visitor behavior), it did not consider tourist typology as a central research topic. Beyond Kalisuci, geotourism demand studies have primarily segmented visitors by motivation (Allan et al., 2015; Amaro et al., 2023; Fung & Jim, 2015; Kim et al., 2008) or developed typologies based on motivation and travel behavior (Hurtado et al., 2014; Marjanović et al., 2023). However, few studies have integrated a psychographic typology with push–pull motivation and evaluated both in relation to sociodemographic characteristics, particularly concerning guided special-interest cave activities in Indonesian geoparks. As a result, Kalisuci managers lack empirical evidence regarding existing visitor segments, their motivations, and potential target segments. A significant gap remains in the comprehensive understanding of tourist typologies and motivations at the Kalisuci Geosite. Such understanding is essential for effective destination management and marketing, as it enables the design of experiences that meet the expectations of diverse tourist segments (Allan et al., 2015). Moreover, insights into geotourism visitors are a strategic prerequisite for developing targeted and sustainable destination management and promotional strategies (Andrlić et al., 2025; Ngoc et al., 2024). The present study introduces a novel combined typology–motivation approach, which has not previously been applied at the Kalisuci Geosite, a UNESCO Global Geopark in Indonesia.

This study is grounded in two established frameworks. Plog's (1974) psychographic typology classifies tourists along an allocentric–psychocentric spectrum based on their preferences for novelty, risk, and familiarity. Dann's (1977) push–pull theory distinguishes internal drivers of travel (push) from destination attributes that attract tourists (pull). In line with Allan et al. (2015), this study operationalizes push-type motives as intrinsic motivation, and destination-related and social influences as extrinsic motivation.

The scientific contribution of this study is threefold. First, it applies a combined typology–motivation approach at a cave-tubing geosite within a UNESCO Global Geopark in Indonesia, addressing a gap in demand-side evidence. Second, it reports two complementary measures and demonstrates that these measures may identify different dominant categories, which has methodological implications for segmentation studies. Third, it examines whether typology and

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motivation differ by gender, age, education, and occupation, providing evidence that can inform segment-specific marketing strategies for Kalisuci.

Accordingly, this study pursues three objectives: (1) to identify the dominant typologies (Adventurer, Culture Enthusiast, Learner, and Escape-Seeker) among tourists at the Kalisuci Geosite; (2) to determine their dominant motivations (intrinsic and extrinsic); and (3) to examine, using the Chi-Square test, whether dominant typology and dominant motivation are associated with gender, age, education, and occupation.

2. Literature Review

2.1. Geotourism

Geotourism represents a form of sustainable tourism in protected areas distinguished by unique geological features (Allan et al., 2015). Vitrianto (2023) describes this paradigm as leveraging a region's geological and geomorphological potential while prioritizing environmental conservation and community well-being. The definition of geotourism is contested and evolving, reflecting disciplinary perspectives and practical applications. The broadening of the concept has enabled greater integration with sustainability and community development, but also raised concerns about diluting its earth science focus (Gates, 2006; Ollier, 2012). The conceptual development of geotourism originates from the Grand Tour and early geological societies, with foundational definitions from the United Kingdom emphasizing geoconservation and geo-interpretation, which have influenced modern UNESCO geopark frameworks (T A Hose & Vasiljević, 2012; Ollier, 2012). As geotourism expanded globally into Europe, Asia, and South America, its frameworks evolved to incorporate socio-economic, cultural, and environmental dimensions, although empirical research in these areas remains limited. Recent academic and institutional initiatives seek to clarify and unify definitions and address conceptual conflicts. R. K. Dowling (2011) stated that global standardization is hindered by regional differences in focus and development. For example, Europe emphasizes geoconservation, authenticity, and scientific value (Abramowicz & Tritt, 2024; T A Hose & Vasiljević, 2012); Asia demonstrates rapid growth but faces environmental, legislative, and awareness challenges (Gao et al., 2013; Sumanapala & Wolf, 2020; Xiao et al., 2007); and South America integrates geotourism within UNESCO Global Geoparks by prioritizing community involvement and local sustainability (Quesada-Román et al., 2022; Rosado-González et al., 2020).

Effective management of these diverse dimensions, whether addressing the scientific, educational, and aesthetic value of natural geological heritage or the cultural and emotional significance of anthropogenic sites, require balanced and sustainable practices that weigh visitor access against conservation (Newsome & Dowling, 2025; Shekhar et al., 2019). Štrba et al. (2023) argued, key factors such as visual attractiveness, uniqueness, accessibility, safety, and educational potential are critical in determining visitor appeal. Ongoing global synthesis highlights that the inclusion of both natural and anthropogenic heritage, together with regional variations, demonstrates the necessity for adaptable yet standardized frameworks to guide geoparks and scenic areas toward inclusive stakeholder engagement and long-term sustainable development.

In the context of Kalisuci, these debates manifest in a distinct configuration. Kalisuci is a karst cave traversed by an underground river within the Gunung Sewu UNESCO Global Geopark. Its primary attraction is guided cave tubing, where visitors explore the cave and river on inner tubes, equipped with helmets, pads, and life jackets, and accompanied by guides. The site integrates the visual appeal and uniqueness of karst geology with physical activity, safety management, and educational and cultural interpretation. These features align with the determinants of visitor appeal identified by Štrba et al. (2023). Unlike sightseeing-oriented geosites, Kalisuci is a special-interest destination that requires visitors to accept physical exertion and managed risk. Therefore, its visitor profile is unlikely to resemble that of general geotourism sites.

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2.2. Typology of Geotourism Tourist

Plog's (1974) typology theory classifies tourists according to psychological characteristics and travel preferences into psychocentric, allocentric, and mid-centric categories. This model is widely recognized for its emphasis on tourists' psychographic profiles, including motivations, behaviors, and destination choices (Aydın & İçöz, 2025; Litvin, 2006). Psychocentric travelers prefer familiar destinations, prioritize comfort and security, and are generally risk-averse and less interested in novel experiences or cultural differences. In contrast, allocentric travelers are more adventurous, seek novel experiences, prefer exploring less-developed destinations, and are receptive to risk and cultural diversity. Plog's model also recognizes a spectrum between these two extremes, with most tourists falling somewhere in the middle (mid-centric), displaying a mix of both allocentric and psychocentric traits (George et al., 2013). Understanding where geotourism fits within this typology helps clarify the motivations and preferences of geotourists.

Geotourism attracts a broad spectrum of visitors, including those seeking tranquility, educational experiences, adventure, and cultural engagement (R. K. Dowling, 2011; Gordon, 2018; Telecka, 2024; Tongkul, 2006). These motivations align more closely with allocentric traits, as such tourists often seek unique, less commercialized, and educational experiences in natural settings (Hurtado et al., 2014). Geotourism is described as a niche market with a relatively narrow audience, which further supports its alignment with allocentric tourists who often seek out specialized, less mainstream experiences (Ateş & Ateş, 2019). However, efforts to broaden geotourism's appeal (e.g., targeting schoolchildren or families) suggest that some psychocentric tourists may also be engaged if experiences are adapted to be more accessible and familiar (Telecka, 2024). Understanding the psychographic diversity of geotourists is essential for market segmentation and product development (Eschiletti, 2021; Šimková & Muzikantová, 2015).

Plog's model is used to identify client needs, motivations, and expectations, which can help tailor geotourism offerings to different segments along the psychocentric-allocentric spectrum. Consequently, applying tourist typology to geotourism activities, such as those in Kalisuci, requires context-specific consideration.

This study applies Plog's spectrum by categorizing geotourists into four types identified in the literature: Adventurer - physical challenge and managed risk (Chaves et al., 2023), Culture Enthusiast - geomythology and local culture (Khoshraftar & Torabi Farsani, 2019), Learner - geological knowledge (Allan & Shavanddasht, 2019), and Escape-Seeker - stress relief and escape from routine (Kim et al., 2008). Within Plog's framework, Adventurers, Culture Enthusiasts, and Learners are expected to demonstrate allocentric tendencies. In contrast, Escape-Seekers are anticipated to be mid-centric, seeking novelty in secure and comfortable settings.

2.3. Motivation of Geotourism Tourist

Tourist motivation is often analyzed using Graham Dann's (1977) Push and Pull Factors Theory of Motivation. This foundational theory in tourism studies categorizes motivation into push and pull factors. Push factors are psychological forces that drive individuals to travel, such as the desire for escape, relaxation, adventure, or social interaction (Barkhordari et al., 2014; Mzimela et al., 2024; Rodríguez et al., 2024). Push factors originate from within the tourist and motivate the decision to travel in general, not to a specific destination. Pull factors are external, destination-specific attributes that attract tourists, such as natural beauty, cultural attractions, or unique experiences (Barkhordari et al., 2014; Mzimela et al., 2024; Rodríguez et al., 2024). Pull factors influence the choice of where to travel, based on the appeal of the destination. Dann's model serves as a widely adopted theoretical framework for examining tourism motivation, though the specific factors may differ by context and population (Ayoub & Mohamed, 2024; Mzimela et al., 2024). Studies have explicitly used Dann's push–pull model to analyze

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motivations for visiting sustainable and geotourism destinations, confirming that both internal and external factors are at play.

To prevent conceptual overlap, this study distinguishes between the two constructs as follows. Push (intrinsic) factors address the question "why do individuals travel?" and refer to internal needs present prior to destination selection, such as curiosity, interest in earth sciences, and the desire for personal satisfaction. Pull (extrinsic) factors address the question "why choose Kalisuci?" and refer to destination attributes or promotional elements that attract visitors, including UNESCO Global Geopark status, affordable prices, tour packages, social media exposure, and recommendations from friends or family. Some items may blur this distinction; for example, the desire for an authentic geotourism experience can function as both an internal motive and a destination attribute. This ambiguity is recognized as a limitation of the present research.

Research on geotourism motivation often references intrinsic (push) and extrinsic (pull) motivations, aligning closely with Dann's framework (Allan et al., 2015; Shavanddasht et al., 2017). Intrinsic motivation relates to the desire to acquire knowledge about earth sciences, experience authentic encounters, pursue personal interests in earth sciences, appreciate the uniqueness of karst landscapes, and derive satisfaction from exploring geosites (Allan et al., 2015; Amaro et al., 2023; Kim et al., 2008). Conversely, extrinsic motivation refers to external influences or destination attributes that encourage travel, such as social influence, digital marketing, UNESCO Global Geopark status, affordable prices, and promotional offers (Rodríguez et al., 2024; Suhud et al., 2025; Xanthakis et al., 2024). There is strong evidence that geotourism motivations can be effectively analyzed using Dann's push–pull model, with both internal and external factors playing significant roles (Allan et al., 2015; Khoshraftar & Torabi Farsani, 2019; Shavanddasht et al., 2017). Chingombe & Taru (2018) stated that understanding these motivations helps in segmenting the geotourism market and tailoring marketing strategies to different tourist profiles. Analyzing intrinsic and extrinsic motivations within geotourism provides insight into tourists' decisions to visit geological sites and participate in geotourism activities in Kalisuci.

2.4. Relationships Among Tourist Typology, Motivation, and Sociodemographic Characteristics

Typology, motivation, and sociodemographic characteristics represent distinct yet interconnected dimensions of a visitor. Typology refers to the traveler's psychographic preferences, motivation addresses the reasons for visiting a specific destination, and sociodemographic characteristics (including gender, age, education, and occupation) indicate the individual's societal position. Typology and motivation are anticipated to be related; for instance, Adventurers are likely to value the intrinsic satisfaction of exploration, while Escape-Seekers may be motivated by a desire to break from routine. Sociodemographic characteristics are also expected to influence both typology and motivation, as factors such as age and occupation affect physical capacity, leisure time available, and the need for respite from work. Previous research has profiled geotourism and cave-tourism segments using sociodemographic variables (Amaro et al., 2023; Mzimela et al., 2024), supporting the examination of these associations at Kalisuci.

2.5. Previous Studies on Geotourist Typology and Motivation

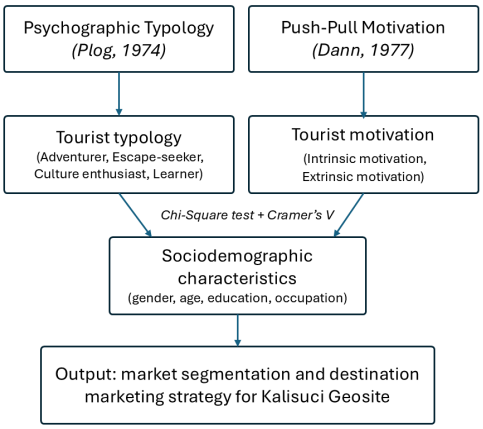
A review of previous studies reveals both areas of consensus and unresolved questions. Allan et al. (2015) at Crystal Cave, Kim et al. (2008) at Hwansun Cave, Shavanddasht et al. (2017) at Alisadr Cave, Amaro et al. (2023) at the Arouca UNESCO Global Geopark, and Fung & Jim (2015) at the Hong Kong Global Geopark all consider motivation as fundamental for understanding or segmenting visitors, with most employing push–pull or intrinsic–extrinsic frameworks. However, their methodologies differ: Allan et al. (2015) utilize self-determination

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theory (intrinsic, extrinsic, and amotivation), Amaro et al. (2023) conduct cluster analysis on five motivation dimensions to identify four visitor segments, Shavanddasht et al. (2017) examine the relationship between motivation and satisfaction, and Hurtado et al. (2014) as well as Marjanović et al. (2023) develop geotourist typologies based on motivation, experience, and travel behavior. To the authors' knowledge, no prior research integrates Plog's psychographic typology with push–pull motivation and evaluates both in relation to sociodemographic characteristics at a guided cave-tubing geosite in Indonesia, which is the specific focus of the present study.

Figure 1 provides an overview of the theoretical framework in relation to the research objectives. Plog's typology and Dann's push–pull theory establish two sets of variables, four typology dimensions and two motivation dimensions, which are analyzed in relation to four sociodemographic characteristics using the Chi-Square test. The objective is to develop a segmentation model that can inform marketing strategies for Kalisuci.

Figure 1. Conceptual framework of the study



3. Method

3.1. Research Site and Design

The research was conducted at the Kalisuci Geosite, one of the primary geosites within the Gunung Sewu Geopark in Gunungkidul. Kalisuci was selected due to its status as a flagship geosite, which offers cave exploration and underground river trekking activities while integrating tourism, education, and conservation functions. The distinctive geological features of Kalisuci attract tourists with a specific interest in geological phenomena, providing a robust sample for identifying tourist typologies and motivations.

A quantitative approach with a cross-sectional survey design was employed. Descriptive statistics characterized the distribution of tourist typologies and motivations, and the Chi-Square test evaluated associations between dominant typologies or motivations and sociodemographic characteristics. Typology and motivation were measured with a Likert-scale questionnaire and analyzed quantitatively.

3.2. Population and Sample Size

The study population consists of all tourists visiting the Kalisuci Geosite. Given the unknown total number of visitors, the Lemeshow formula was employed with a 95% confidence level and a 10% margin of error, yielding a calculated sample size of 96 individuals.

According to Ahmed (2024), selecting a precision level between 1% and 10% is a standard tolerance range in social survey research. The final sample size exceeded the minimum threshold to address potential issues such as defective questionnaires, incomplete responses, or invalid data identified during data screening. Since accidental (non-probability) sampling was utilized, the margin of error is indicative only and does not allow for statistical generalization to all Kalisuci visitors.

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$$n = \frac{z^2 \times P(1-P)}{d^2}$$

$$n = \frac{1.96^2 \times 0.5 \times 0.5}{0.10^2}$$

$$n = 96.06 \approx 96$$

3.3. Instruments and Data Collection Techniques

The research instrument was a questionnaire divided into three sections: sociodemographic data, tourist typology, and tourist motivation. Tourist typology and motivation were measured using quantitative data on a 1–5 Likert scale (1 = Strongly Disagree; 5 = Strongly Agree). Data collection was conducted through a field survey utilizing a questionnaire with closed-ended questions, including multiple-choice and Likert-scale items. Accidental sampling was employed at strategic locations such as entrances, information centers, and parking areas. Trained enumerators distributed the questionnaires following standardized data collection procedures. Coordination with Kalisuci Geosite management ensured access permits, facilitated the survey process, and supported the direct application of research findings by site management. The anticipated outcomes include sociodemographic profiles, tourist typologies, and tourist motivations.

Table 1. Research variables

Dimension	Indicators	Statement
Tourist Typology	Adventurer (Chaves et al., 2023)	– I am drawn to tourist activities that present physical challenges. – In general, I enjoy trips that involve uncertainty and a sense of adventure. – I prefer destinations that provide experiences that differ from conventional tourism. – I am interested in geotourism activities that incorporate managed risks.
	Culture Enthusiast (Khoshraftar & Torabi Farsani, 2019)	– I am interested in learning about the mythology and legends associated with this karst region. – The traditional knowledge of the communities surrounding Kalisuci is a significant attraction for me. – I seek to understand the relationship between local culture and the distinctive geology of this area.
	Learner (Allan & Shavanddasht, 2019)	– On trips I usually read information boards or ask guides to learn about the places I visit. – Scientific and educational information regarding underground caves is essential for my visit. – I actively seek new knowledge about natural phenomena during my travels.
	Escape-Seeker (Kim et al., 2008)	– I visited Kalisuci to escape my daily routine and alleviate stress. – I prefer trips that allow me to disconnect from work or study obligations. – I select outdoor destinations to attain inner peace.
Tourist Motivation	Intrinsic Motivation (Allan et al., 2015; Amaro et al., 2023; Kim et al., 2008)	– A profound curiosity about subterranean natural phenomena motivated my visit. – I was motivated by the desire to engage in an authentic geotourism experience. – This visit reflects my personal interest in the earth sciences, particularly geology. – I seek to deepen my understanding and appreciation of the distinctive karst landscape. – The intrinsic satisfaction derived from successfully exploring the cave serves as my primary motivation.
	Extrinsic Motivation (Rodríguez et al., 2024; Suhud et al., 2025; Xanthakis et al., 2024)	– Recommendations from friends or family influenced my decision to select Kalisuci as my destination. – Social media content, including photographs and videos about Kalisuci, influenced my decision to visit. – Kalisuci's designation as part of the UNESCO Global Geoparks network heightened my interest. – Affordable ticket prices and activity fees were a factor in my decision to visit – Promotions and tour packages provided by the management encouraged me to visit.

Source: Research interpretation (2026)

Data collection occurred over two months, specifically June and July 2026. Respondents included tourists who purchased a cave tubing package, were at least 18 years old, and consented

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to complete a questionnaire. Questionnaires were distributed after participants completed the cave tubing activity and had time to freshen up. Consent was obtained prior to questionnaire administration. In addition to the paper questionnaire, a QR code linking to an electronic version was provided and displayed in the visitor registration area. Item validity was assessed using Pearson's product–moment correlation between each item and its corresponding dimension total, based on a trial sample of 30 participants; items were considered valid when the r-count exceeded the r-table value of 0.361 ($\alpha = 0.05$). Reliability was evaluated using Cronbach's alpha, with $\alpha \geq 0.70$ deemed acceptable. All 23 items demonstrated validity, and all dimensions exhibited reliability.

3.4. Data Processing and Analysis

Prior to analysis, the collected data were edited to ensure response completeness, coded by converting questionnaire responses into numerical values, and tabulated using Microsoft Excel. The tabulated data were subsequently analyzed statistically with SPSS 25 software. Results are presented in tables and graphs. Descriptive statistics were used to characterize tourist typologies and motivations. Dominant typologies and motivations were identified using the mode of individual classification results or the highest percentage of respondents in each category. Mean values for each dimension were also presented as supplementary information to illustrate the intensity of each dimension's tendency across the sample. This dual approach provides a more comprehensive interpretation: the mean reflects the general strength of a tendency among tourists, while the mode identifies the most common tourist type at the study site.

For each respondent, the score for each dimension was calculated as the mean of its items (1–5). Respondents were assigned to the typology (Adventurer, Culture Enthusiast, Learner, or Escape-Seeker) corresponding to their highest mean score, and to the motivation type (intrinsic or extrinsic) with the higher mean score. In cases where respondents had identical highest scores on multiple dimensions, such as both Adventurer (4.0) and Learner (4.0), classification was determined either randomly using a random number generator or by assigning the respondent to the dimension with the fewest members to maintain a balanced data distribution.

Cross-tabulation analysis was conducted to examine relationships between variables in each category, specifically between dominant tourist typologies and motivations and sociodemographic characteristics. The significance of these relationships was tested using the Chi-Square (χ^2) test at a significance level of $\alpha = 0.05$. The null hypothesis (H_0) posits no relationship between the variables, while the alternative hypothesis (H_1) posits a relationship. The χ^2 value was calculated based on the difference between observed frequencies (fo) and expected frequencies (fe) in each cell of the cross-tabulation table. Degrees of freedom (df) were determined by multiplying the number of row categories minus one by the number of column categories minus one, counting only categories with at least one respondent. The null hypothesis was rejected if the resulting p-value was less than 0.05, indicating a statistically significant relationship between the variables. The test requires categorical variables, independent observations (one response per respondent), and sufficient expected frequencies, defined as no more than 20% of cells with an expected count below 5 and none below 1. The strength of significant associations was measured using Cramér's V. Because more than 20% of the cells had an expected count less than 5 and the original data category structure was retained to preserve informational depth, the significance test for proximity was conducted using Fisher's Exact Test at a 99% confidence level.

4. Results

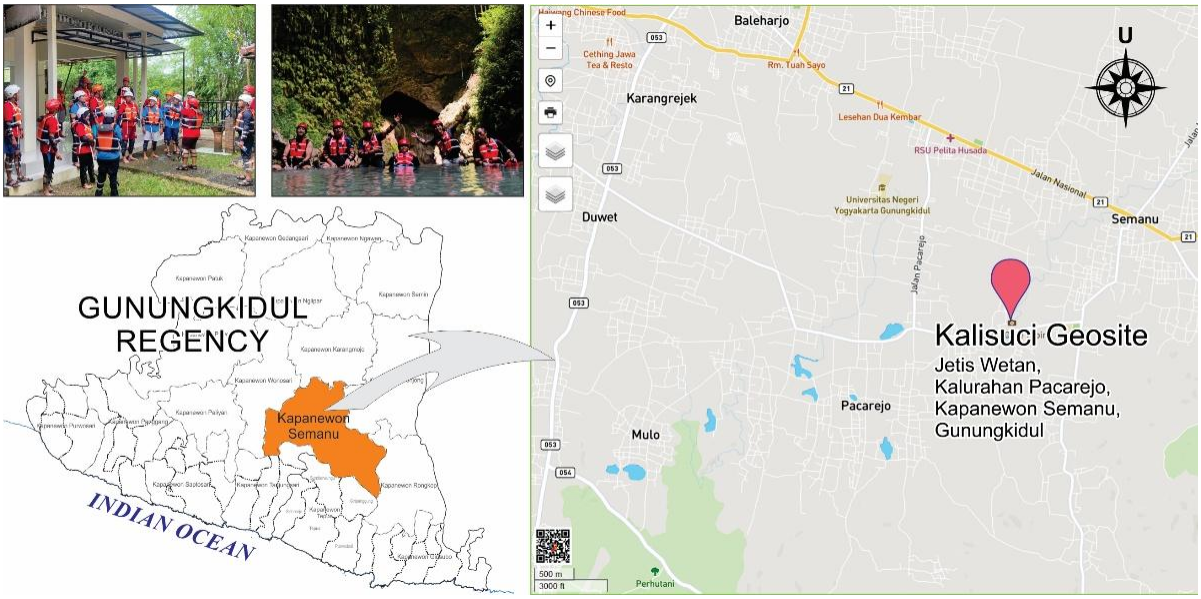
4.1. Research Location and Geographic Conditions

The Kalisuci Geosite is situated in Semanu Subdistrict, Gunungkidul Regency, Special Region of Yogyakarta, within the karst landscape of the Gunung Sewu UNESCO Global Geopark, at coordinates S8°0'34.76"E110°38'21.36". In this area, exploration of the cave requires specialized

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equipment, including rubber boats, ropes, and other gear. The site features notable stalactites and stalagmites, with a harmonious blend of natural beauty and cool temperatures that provide a challenging adventure. Kalisuci Cave exhibits characteristics similar to the more widely recognized Pindul Cave Geosite, although development at Kalisuci commenced earlier. Historically, the local community utilized Kalisuci Cave as a source of clean water, consistent with the use of other caves containing underground rivers in karst regions (Vitrianto et al., 2021). Prior to its development as a tourist destination, land use in the surrounding area was primarily residential, agricultural (rice fields and other farmland), public facilities such as mosques, and the Kalisuci Cave geological site with its underground river. The cave tubing route at Kalisuci Cave extends approximately 500 meters, with water depths ranging from 1 meter to 3 meters. Traversing the entire cave system offered by the Kalisuci Cave tubing tour requires approximately 1.5 to 2 hours, beginning at Suci Cave, passing through Luweng Senglat and Luweng Geleng, and concluding at Mburi Omah Cave (Kalurahan Pacarejo, 2023).

Figure 2. Location and documentation of the Kalisuci Geosite.



Research data (2026)

4.2. Socio-demographic and Characteristics of Respondents

A total of 126 questionnaires were collected through the distribution of the research instrument. After screening and cleaning, six defective questionnaires were excluded from data processing, resulting in a final valid sample of 120 questionnaires. This sample size exceeded the minimum threshold of 96 respondents. Consequently, the actual error rate decreased to 8.95% ($e = 1.96 \times \sqrt{(0.25 / 120)}$), indicating improved data precision in identifying tourist typologies and motivations. The majority of tourists participating in cave tubing activities at Kalisuci were male (55%), while females comprised 45%. Most respondents (61.7%) were aged 20–29, and 24.2% were under 20 years old. Regarding educational attainment, 59.2% of respondents held a higher education degree, 40% had completed secondary education, and only 0.8% had a primary education. The sample is therefore dominated by young adults (85.9% under 30 years), students (46.7%), and private-sector workers (32.5%), which should be kept in mind when interpreting the results.

Table 2. Socio-demographic Characteristics

Variable	Indicator	Frequency (n)	Percentage (%)
Gender	Male	66	55.0
	Female	54	45.0
	Total	120	100.0

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Variable	Indicator	Frequency (n)	Percentage (%)
Age	<20 years	29	24.2
	20-29 years	74	61.7
	30-39 years	14	11.7
	40-49 years	3	2.5
	≥50 years	0	0.0
	Total	120	100.0
Education	Elementary/ Junior High School	1	0.8
	High School/ Vocational High School	48	40.0
	Diploma	0	0.0
	Bachelor's/ Master's/Doctorate	71	59.2
	Total	120	100.0
Occupation	Student	56	46.7
	Civil Servant	1	0.8
	Private Sector	39	32.5
	Entrepreneur	2	1.7
	Other	22	18.3
	Total	120	100.0

Source: Research data (2026)

4.3. Tourist Typologies and Motivations

Analysis of average scores across the four typological dimensions revealed that the "Escape-Seeker" dimension received the highest mean score, followed by "Adventurer," "Culture Enthusiast," and "Learner." This suggests that tourists at the Kalisuci Geosite generally exhibit a strong tendency toward escape-seeking at the sample level. However, individual-level classification based on each respondent's highest dimension score produced different results. The largest share of respondents (n = 54; 45.0%) were classified as the "Adventurer" type, while the "Escape-Seeker" type accounted for 34.2% (n = 41), followed by "Culture Enthusiast" (14.2%; n = 17) and "Learner" (6.7%; n = 8). These findings suggest that, although escape-seeking is a prominent tendency among respondents, the Adventurer typology is the most prevalent and best represents the overall identity of Kalisuci tourists.

The two measures differ because the mean score and the classification count address distinct research questions. The mean (Table 3) indicates the overall strength of agreement among all 120 respondents with the items of each dimension. In contrast, classification assigns each respondent to the single dimension on which they scored highest. The Escape-Seeker dimension obtained the highest mean (4.39), likely due to high agreement with its items across all respondent types, suggesting it represents a widely shared secondary tendency. Although the Adventurer dimension has a lower mean (4.21), it was the highest-scoring dimension for the largest number of individual respondents (n = 54), making it the most frequent primary type. Consequently, escape-seeking is interpreted as a prevalent underlying need, while adventure emerges as the most common defining type among Kalisuci visitors.

Regarding motivation, the average score for extrinsic motivation was marginally higher than that for intrinsic motivation at the sample level. However, individual classification showed that slightly more than half of respondents (n = 64; 53.3%) exhibited dominant intrinsic motivation, while 46.7% (n = 56) demonstrated dominant extrinsic motivation. These findings indicate that intrinsic motivation, such as curiosity about subterranean phenomena, interest in earth sciences, and satisfaction from exploring the cave, is slightly more prevalent as the dominant motive. Both types of motivation are strong, with mean scores above 4.0, and the differences are minimal (6.6 percentage points in classification; 0.11 points in mean score). Thus, motivation at Kalisuci is best characterized as mixed, with a slight intrinsic tendency rather than being primarily internal.

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Table 3. Typology and Motivations of Visitors in Kalisuci

Dimension	Mean (Score Intensity)	n Respondents	% of Respondents
Tourist Typology			
Adventurer	4.21	54	45.0
Culture Enthusiast	4.01	17	14.2
Learner	3.99	8	6.7
Escape-Seeker	4.39	41	34.2
Tourist Motivation			
Intrinsic Motivation	4.00	64	53.3
Extrinsic Motivation	4.11	56	46.7

Source: Research data (2026)

4.4. Cross-tabulation Analysis

The Chi-Square test results for eight pairs of variables indicate that dominant typology is significantly associated with age group ($\chi^2 = 28.28$; df = 12; p = 0.005) and occupation ($\chi^2 = 28.56$; df = 12; p = 0.005). The strength of these associations' ranges from weak to near-moderate, as indicated by Cramér's V of 0.28 for both. In contrast, dominant typology does not exhibit a significant relationship with gender (p = 0.572) or educational level (p = 0.978), or income level (p > 0.05). Additionally, dominant motivation does not demonstrate a significant association with any of the four demographic variables examined (all p > 0.05). Several cells have very small expected frequencies (for example, 3 respondents aged 40–49 and 8 Learners yield an expected count of 3 × 8 / 120 = 0.2). The Chi-Square approximation is therefore weak, so the significant results should be interpreted as indicative rather than conclusive.

Table 4. Cross-tabulation

Dimension	**Socio-demographic variables**	**Chi-Square (χ^2)**	**df**	**p-value**	**Cramer's V**	**Interpretation**
Dominant Typology	Gender	2.000	3	0.5724	0.129	No relationship
	Age	28.279	12	0.0050	0.280	There is a relationship
	Education	4.294	12	0.9775	0.109	No relationship
	Occupation	28.555	12	0.0046	0.282	There is a relationship
Dominant Motivation	Gender	0.087	1	0.7686	0.027	No relationship
	Age	5.377	4	0.2507	0.212	No relationship
	Education	0.931	4	0.9201	0.088	No relationship
	Occupation	4.086	4	0.3945	0.185	No relationship

Source: Research data (2026)

The two significant associations reveal distinct patterns. Within the age group variable, the Adventurer and Escape-Seeker types are predominantly represented by individuals aged 20–29 (63.0% and 58.5%, respectively), and the Culture Enthusiast type is also highly concentrated in this age group (82.4%). Regarding occupation, the Adventurer and Learner types are primarily composed of students (53.7% and 75.0%, respectively), whereas the Escape-Seeker type is more common among private-sector workers (58.5%). These percentages must be read against the sample composition: because 61.7% of all respondents are aged 20–29, shares of 63.0% (Adventurer) and 58.5% (Escape-Seeker) are close to the sample baseline and do not by themselves indicate a concentration; the age association may rather arise from the Culture Enthusiast group (82.4%) and from differences in the under-20 and 30–39 groups (Table 5). The

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occupational pattern is clearer: private-sector workers are 32.5% of the sample but 58.5% of Escape-Seekers. These findings suggest that escape-oriented travel may be more relevant to private-sector workers than to students; this interpretation rests on the observed percentages and was not tested directly.

Table 5. Distribution of dominant typology by age group and occupation

Characteristic	Adventurer	Culture Enthusiast	Learner	Escape-Seeker
Age group (years)				
<20	27.8%	5.9%	75.0%	17.1%
20–29	63.0%	82.4%	25.0%	58.5%
30–39	3.7%	11.8%	0.0%	24.4%
40–49	5.6%	0.0%	0.0%	0.0%
≥50	0.0%	0.0%	0.0%	0.0%
Occupation				
Student	53.7%	47.1%	75.0%	31.7%
Civil servant	0.0%	0.0%	0.0%	2.4%
Private employee	14.8%	35.3%	12.5%	58.5%
Entrepreneur	3.7%	0.0%	0.0%	0.0%
Others	27.8%	17.6%	12.5%	7.3%
n (respondents)	54	17	8	41

Source: Research data (2026)

5. Discussion

5.1. Typologies of Kalisuci Tourists

The predominant tourist profile at Kalisuci is the adventurer, who best embodies the overall identity of visitors to this destination. These individuals are attracted to the physical challenges and thrilling activities available, such as cave tubing, which involves exploring karst caves via rivers using inner tubes. Cave tubing exemplifies the adventurous spirit required, as it demands physical exertion and exploration of unique geological formations. With 45.0% of respondents (n = 54), the Adventurer is the most frequent primary type, indicating that Kalisuci's geographical features and outdoor activity offerings are the primary attractions for this segment. These findings are consistent with tourist typology theory (Plog, 1974), which posits that destinations characterized by challenging activities and natural landscapes predominantly attract allocentric tourists. Dumitras et al. (2021) note that adventure travelers prioritize opportunities for physical activity and exploration of natural settings. The pursuit of adventure and active participation are the principal motivating factors for these travelers (R. K. Dowling, 2011; Kim et al., 2008; Marjanović et al., 2023). These results are in line with previous research, which indicates that geotourism activities are structured to balance excitement, education, and sustainability, while accommodating diverse interests and risk preferences (Chakrabarty & Sadhukhan, 2019; Erfurt-Cooper, 2011; Ritpanitchajchaval et al., 2023). Cave tubing at Kalisuci is guided and equipped with safety gear, resulting in a managed rather than extreme adventure experience, which aligns with the questionnaire item on "managed risks." However, Adventurer is not the highest-scoring dimension on average (mean 4.21 compared to 4.39 for Escape-Seeker), indicating that while adventure is a common defining type, it is not the sole motive for visitors.

The second most prevalent tourist typology is the "Escape-Seeker," (34.2%; n = 41), which also has the highest mean score (4.39) and is characterized by a desire to alleviate stress, escape daily routines, and attain peace. According to Plog's (1974) theory of tourist typology, this group aligns with the "Mid-centric" type, which occupies an intermediate position between psychocentric and allocentric types, exhibiting characteristics of both. Furthermore, Iso-Ahola's

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(1982) theory posits that Escape-seeker travelers are motivated by dual objectives: achieving self-fulfillment and escaping routine through social interaction and novel experiences. These travelers are willing to participate in physical activities, provided these occur in safe and familiar environments that allow for uninterrupted relaxation. They typically prefer well-developed natural destinations offering structured tour packages and facilities that ensure certainty and a high degree of physical comfort. For example, the cave tubing activity at Kalisuci is governed by strict safety regulations due to its physical demands and inherent risks. Tourists are provided with helmets, elbow and knee pads, life jackets, and receive a safety briefing from guides. These observations are consistent with findings by Chylińska (2022) and Chakrabarty & Sadhukhan (2019), which indicate that "Escape-Seeker" tourists are generally motivated by a desire to escape routine, pursue new experiences, and seek adventure in natural or less-traveled locations. While they participate in adventurous activities, they prioritize safety assurances and adequate facilities to maintain comfort throughout their trip. The safety protocols and guided structure of cave tubing at Kalisuci align with these preferences; however, visitor satisfaction was not assessed in this study. This activity type is most strongly associated with occupation, as 58.5% of Escape-Seekers are private-sector workers, compared to 32.5% of the overall sample.

The third typology comprises culture enthusiasts (14.2%; n = 17) who visit Kalisuci because they are interested in the mythology and legends of the karst region, the local wisdom of surrounding communities, and a desire to understand the relationship between local culture and the area's distinctive geology. According to Plog's (1974) typology theory, these tourists are classified as allocentric. Rather than solely appreciating natural scenery or participating in physical adventure activities, they pursue a comprehensive understanding that integrates intellectual, historical, spatial, and sociocultural dimensions of the local community (Šimková & Muzikantová, 2015). Geotourism frequently merges geological heritage with cultural experiences, attracting those interested in local wisdom and identity (Gordon, 2018; Telecka, 2024; Tongkul, 2006). During cave exploration in Kalisuci, tourists receive cultural interpretations, such as explanations of the cave's name, the reciprocal relationship between the community and the karst area, and local wisdom in conserving the cave's natural condition. These findings are consistent with those of Dumitras et al. (2021) and Chauhan (2025), who identified geotourists interested in local wisdom and cultural heritage in addition to geological exploration. Chauhan (2025) contends that cultural interaction is a core component of transformative adventure tourism, positively affecting tourist satisfaction, destination image, and revisit intentions. The presence of cultural interpretation during cave tubing in Kalisuci may distinguish it from other adventure tourism activities that lack such interpretation. Telecka (2024) demonstrates that deep cultural engagement can serve as a unique selling point and provide a richer, more meaningful experience, thereby shaping a distinctive form of adventure tourism. However, this segment is small, with 14 of the 17 Culture Enthusiasts (82.4%) aged 20–29, indicating that it is predominantly composed of young individuals.

The least common tourist profile in Kalisuci is the "learner" type (6.7%; n = 8). Individuals who actively seek scientific knowledge about geological processes, karst phenomena, and underground cave systems at the Kalisuci Geosite are classified as "allocentric" according to typological theory (Plog, 1974). These tourists are characterized by a strong need for new stimulation and uncommon insights (R. K. Dowling, 2011; Hurtado et al., 2014). Their interest in understanding geological processes and the hydrological dynamics of Kalisuci's underground caves demonstrates an intellectually motivated pursuit of novelty. They value both formal and informal knowledge about geological phenomena and the scientific significance of geological sites (Chylińska, 2019; Gates, 2006; Rybár & Domingo, 2014; Tongkul, 2006). The Kalisuci geosite is distinguished by its karst cave traversed by a river. During the river journey through the cave, tourists receive detailed information about the cave's formation, and the geological phenomena present at Kalisuci. Educational experience attracts learners who gain new knowledge while

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engaging in recreational activities. Given that only eight respondents were recorded, conclusions regarding this segment remain tentative. The limited proportion indicates that educational content at Kalisuci is presently consumed as a supplementary aspect of recreation rather than serving as the primary motivation for visitation.

5.2. Tourists Motivations in Kalisuci

The results demonstrate that tourist motivation at the Kalisuci geosite is diverse, with 53.3% classified as intrinsically motivated and 46.7% as extrinsically motivated. The mean score for extrinsic motivation (4.11) was slightly higher than that for intrinsic motivation (4.00). Intrinsic motivation in this context includes curiosity, the pursuit of authentic geotourism experiences, interest in geology, the desire to understand and appreciate the karst landscape, and satisfaction derived from successfully exploring a karst cave. According to the push-and-pull factor theory of motivation (Dann, 1977), internal motivation is a key driver of travel behavior. This result is consistent with Kim et al. (2008), who found that tourists at Hwansun Cave in Korea participated in geotourism activities to gain authentic experiences. At Kalisuci, tourists are particularly motivated by the opportunity to engage in unique activities such as cave tubing. The geological processes that formed the karst caves may be especially appealing to "Learner" type tourists seeking to expand their knowledge of earth sciences. Intrinsic motivation, particularly the satisfaction derived from exploring geosites, is thus a significant factor for visitors. Extrinsic motivations also influence tourists visits to Kalisuci almost as often. These include recommendations from friends or family, social media content, Kalisuci's designation as a UNESCO Global Geopark, pricing, and tour packages offered by management. Such external influences correspond with Dann's (1977) push-and-pull factor theory.

As a geotourism destination, Kalisuci possesses attributes that are communicated by media or individuals, subsequently shaping potential visitors' decisions. This observation is supported by Suhud et al. (2025), who confirm that destination image formation through promotion affects tourists' intentions to visit geosites. The nearly equal significance of the two motivation types indicates that promotional strategies should not depend solely on product experience. Factors such as social media, word of mouth, UNESCO status, pricing, and package offerings are nearly as influential as individual interest in caves and geology. Both intrinsic and extrinsic motivations are essential for effective market segmentation and the development of geotourism products in Kalisuci. Management should tailor tourism experiences, enhance visitor satisfaction, and encourage repeat visits by addressing the motivations of different tourist segments.

5.3. Correlation Between Dominant Tourist Typologies and Sociodemographic Characteristics

Cross-tabulation analysis revealed a significant relationship between dominant tourist typology and the variables of age and occupation (Table 4). Most tourists are aged 20–29 (61.7%), representing young adults within the late Generation Z and early Millennial cohorts. Although not directly measured in this study, it is plausible that younger visitors are more inclined to select nature-based activities that require physical exertion and provide excitement, rather than passive sightseeing. Previous research by Kim et al. (2008) and P. Purwanto et al. (2020) supports this trend, indicating that cave exploration is particularly popular among younger tourists. Occupation also shows a significant association with tourist typology: students comprise 53.7% of Adventurers and 75.0% of Learners (6 of 8 respondents), while private-sector workers constitute 58.5% of Escape-Seekers despite representing only 32.5% of the sample. This pattern should be interpreted with caution; escape-oriented travel may be more relevant to private-sector workers, for whom leisure serves as a respite from work, whereas adventure is more prevalent among students. These interpretations are based on observed percentages; as the study did not

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measure workload, free time, physical stamina, or psychological condition, no causal inference can be made.

The findings reveal a clear market segmentation that can guide the sustainable management of the Kalisuci geosite. The following segment-specific recommendations are derived from the results. Adventurer segment (45.0%; predominantly students). Promotional strategies should highlight the physical challenge and managed-risk aspects of cave tubing. Outreach efforts should target university nature clubs and academic programs in geography, geology, or tourism, as well as offer group packages and utilize short-form social media content. This approach aligns with the demographic profile, as 61.7% of respondents are aged 20–29, and extrinsic motivation is nearly as prevalent as intrinsic motivation (46.7%).

Escape-Seeker segment (34.2%; primarily private-sector workers). It is recommended to provide after-work and weekend packages, clear safety information, and comfortable facilities. Marketing messages should emphasize relaxation and stress relief, and encourage word-of-mouth recommendations from friends and colleagues, reflecting one of the key extrinsic motivations identified.

Culture Enthusiast and Learner segments (combined 20.9%). Experience-based products should be developed, involving local community members as storytellers and cave guides who deliver structured geological interpretation. Given the small size of these segments, new products should be piloted and closely monitored prior to significant investment.

All segments. As intrinsic (53.3%) and extrinsic (46.7%) motivations are nearly equally prevalent and show no association with sociodemographic variables, communication strategies should integrate product-experience content (curiosity, authenticity, geology) with pull factors such as UNESCO Global Geopark status, affordable pricing, and tour packages for all segments.

5.4. Absence of Significant Associations Between Motivation and Sociodemographic Characteristics

Dominant motivation (intrinsic versus extrinsic) was not significantly associated with gender ($p = 0.769$), age ($p = 0.251$), education ($p = 0.920$), or occupation ($p = 0.395$). Several explanations may account for this finding. First, motivations may be genuinely shared across visitor groups, as both intrinsic and extrinsic motives scored highly (means of 4.00 and 4.11) at a destination centered on a single primary product, cave tubing. This suggests that visitors from diverse backgrounds may be attracted by similar factors. Second, the two motivation categories are nearly balanced (53.3% versus 46.7%) and may have been assigned based on small differences between mean scores, resulting in limited variation to explain. Third, the sample is relatively homogeneous (85.9% under 30 years; 46.7% students), and several categories include very few respondents, which reduces statistical power. Previous studies have profiled geotourism and cave-tourism segments by sociodemographic variables (Amaro et al., 2023; Kim et al., 2008; Mzimela et al., 2024). Collectively, these studies indicate that demographic variables, particularly age and education, significantly influence tourists' travel motivations, although the magnitude of their impact may vary depending on the destination context. Research by Mzimela et al. (2024) and Kim et al. (2008) demonstrates that age consistently affects psychological orientation and travel behavior, such as younger generations' preference for novelty and the greater need for relaxation among older age groups.

Educational attainment also shapes the depth of cognitive motivation. However, demographic influences are not consistent across all dimensions; for instance, gender does not always produce significant differences in certain psychological drivers (push factors). Consequently, destination managers should combine demographic analysis with a comprehensive approach that incorporates psychographic segmentation and motivational factors. For managers, the practical implication is that while sociodemographic variables assist in

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identifying visitor typologies, they do not explain visitor motivations; therefore, motivation-based messages can be directed to all segments.

Several limitations should be considered in guiding future research. (1) Sampling: The use of accidental (non-probability) sampling at a single geosite restricts the generalizability of findings to all Kalisuci visitors or other geosites, and the reported margin of error is only indicative. (2) Sample composition: 85.9% of respondents under 30 years and 46.7% students, older visitors, families, and non-student workers are underrepresented. Furthermore, some cross-tabulation cells were too small for reliable Chi-Square tests. (3) Measurement: All variables were self-reported using Likert scales; certain typology and motivation items are conceptually similar, and the intrinsic–extrinsic classification does not fully distinguish between push and pull factors. (4) Classification: Assigning each respondent to a single dominant type may overlook visitors with mixed profiles; future studies could employ factors or cluster analysis. (5) Timing: Data collection was limited to June and July 2026, so seasonal variations were not assessed. (6) Scope: Income was not included in the analysis, and satisfaction, revisit intention, and spending were not measured. Future research should utilize larger and more diverse samples, include additional geosites within the Gunung Sewu UNESCO Global Geopark, and apply multivariate methods.

6. Conclusions and Limitations

Kalisuci, a flagship geosite within the Gunung Sewu UNESCO Global Geopark, aims to regulate tourist flows while safeguarding its geological heritage. Understanding tourist typologies and motivations is therefore essential for effective development, management, and long-term sustainability. The research findings indicate that the predominant tourist typologies at Kalisuci are "Adventurer" (45.0%) and "Escape-Seeker" (34.2%). These categories are typically associated with destinations that provide opportunities for physical activity and nature exploration, while also prioritizing visitor safety and comfort. Motivation within the sample is mixed, with a slight predominance of intrinsic motivation (53.3% compared to 46.7%), although the mean score for extrinsic motivation is marginally higher. A significant relationship is observed between dominant typology and the sociodemographic characteristics of age and occupation; however, motivation does not demonstrate an association with any sociodemographic variable. Within this sample, students are more frequently classified as Adventurers, while private-sector workers are more commonly identified as Escape-Seekers.

These findings demonstrate a theoretical alignment between destination attractions (supply) and market segmentation (demand). Furthermore, this study advances the understanding of tourist typology and motivation in geotourism by integrating Plog's typology with Dann's push–pull motivation within a single research design, and by illustrating that mean intensity and individual-level classification may yield different dominant categories. Effective destination development strategies should be tailored to the needs of specific market segments to sustain equilibrium between supply and demand. For destination managers, these results offer a foundation for targeting previously overlooked tourist segments in future marketing efforts. Social media is recommended as a marketing tool, as most respondents are under 30 years old; however, digital behavior was not measured in this study and warrants further investigation. Future research should expand the scope within the geopark to encompass a wider range of attractions, such as tourism villages and beaches, to enable a more comprehensive analysis of tourist typologies in the geopark context. Additionally, employing probability or quota sampling with larger and more diverse samples, as well as applying multivariate segmentation methods, is recommended.

Several limitations should be considered in guiding future research. (1) Sampling: The use of accidental (non-probability) sampling at a single geosite restricts the generalizability of findings to all Kalisuci visitors or other geosites, and the reported margin of error is only indicative. (2) Sample composition: 85.9% of respondents under 30 years and 46.7% students, older visitors,

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families, and non-student workers are underrepresented. Furthermore, some cross-tabulation cells were too small for reliable Chi-Square tests. (3) Measurement: All variables were self-reported using Likert scales; certain typology and motivation items are conceptually similar, and the intrinsic–extrinsic classification does not fully distinguish between push and pull factors. (4) Classification: Assigning each respondent to a single dominant type may overlook visitors with mixed profiles; future studies could employ factors or cluster analysis. (5) Timing: Data collection was limited to June and July 2026, so seasonal variations were not assessed. (6) Scope: Income was not included in the analysis, and satisfaction, revisit intention, and spending were not measured. Future research should utilize larger and more diverse samples, including additional geosites within the Gunung Sewu UNESCO Global Geopark, and apply multivariate methods.

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9. Conflict of Interest

This research was funded by the Ministry of Higher Education, Science, and Technology (Kemdiktisaintek) of the Republic of Indonesia through Penelitian Dosen Pemula (PDP) scheme under the BIMA program for Fiscal Year 2026, based on Research Contract No. 0350.43/LL5-INT/AL. 04.03/2026 dated 28 April 2026, and No. 5.7/LPPM.PN.BIMA/STIPRAM/V/2026.

10. Declaration of the use of AI

The authors declare that, during the preparation of this work, Grammarly was used for language editing, grammar checking, and proofreading to enhance the readability and clarity of the text. Following the use of this tool, the authors reviewed and edited the content as necessary and assume full responsibility for the final publication.

11. Authors' Contribution

Amri Amirrulloh: Conceptualization, Methodology, Supervision, Funding acquisition. **Aneke Rahmawati**: Formal analysis, Writing - Original Draft, Project administration. **Ahmad Andi Rif'an**: Formal analysis, Data Curation, Investigation. **Primantoro Nur Vitrianto**: Formal analysis, Writing - Original Draft, Validation. **Jussac Maulana Masjhoer**: Formal analysis, Writing - Review & Editin.

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