

# The Visibility Paradox of Conservation Communication in UNESCO Geoparks: *Evidence from Social Media Analysis of Ijen Geopark*

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## Abstract

Social media has become a key arena for mediated communication, shaping how public meanings are constructed and circulated around environmental and tourism related issues. This study examines how conservation and sustainability messages are framed and made visible within social media discourse surrounding Ijen UNESCO Global Geopark, Indonesia. Employing a convergent mixed methods design, the research analyzes 1,658 posts published on YouTube and X (Twitter) between 2021 and 2024. Quantitative content analysis shows that tourism-oriented frames dominate the discourse (81.9%), while conservation (1.5%) and educational frames (3.6%) receive limited visibility. Engagement analysis further indicates that conservation focused messages generate substantially lower interaction than tourism driven content. However, posts that strategically integrate conservation within tourism or cultural frames achieve significantly higher engagement. Qualitative thematic analysis identifies three dominant communication strategies that enhance conservation visibility: framing conservation through natural spectacle, amplifying local community voices, and communicating the balance between development and environmental protection. The findings reveal a “visibility paradox” in mediated environmental communication, where messages central to sustainability are marginalized by engagement-oriented platform logics. By foregrounding the role of framing and platform affordances in shaping message circulation, this study contributes to media and communication scholarship on digital discourse and offers practical implications for strategic communication in sustainability-oriented destinations.

**Keywords:** media framing, digital discourse, environmental communication, social media, sustainability communication, UNESCO Global Geoparks

## 1. Introduction

Social media has become a central arena of mediated communication in which public meanings are produced, circulated, and contested within digital environments. Platforms such as YouTube, Instagram, and X (Twitter) no longer function merely as channels for information dissemination but operate as socio-technical systems that structure visibility, attention, and engagement through algorithmic logics and platform affordances (Munar & Jacobsen, 2014). These dynamics have profound implications for sustainability-oriented communication, where normative goals such as conservation and education must compete with attention driven content within highly visual and engagement-oriented media ecosystems.

For destinations with explicit sustainability mandates, including UNESCO Global Geoparks, this condition creates a distinctive communicative dilemma. UNESCO Global Geoparks are designed as integrated models of sustainable development, tasked with simultaneously promoting tourism, conserving geological heritage, and fostering education for sustainable development (Stoffelen, 2020). While social media offers geoparks unprecedented opportunities to reach global audiences and enhance public engagement, it also tends to privilege tourism-oriented narratives that align with visual appeal and experiential consumption. As a result, conservation and educational messages often struggle to achieve comparable visibility within algorithm driven platforms that reward popularity and interaction (Gladwin, 2020; Gössling, 2021).

Existing scholarship has extensively examined the role of social media in tourism marketing, destination branding, and audience engagement. Studies emphasize the importance of community participation, technological innovation, and digital storytelling in shaping sustainable tourism communication (Abd Hamid et al., 2025; Bhatt & Dani, 2024; Palazzo et al., 2022). Research has also highlighted how destination identity is constructed through visual narratives and user-generated content (Carvajal-Aparicio et al., 2024; Gherheş et al., 2025). However, despite this growing body of literature, relatively little attention has been paid to how conservation, education, and sustainable development objectives are framed and made visible within social media discourse, particularly in the context of UNESCO Global Geoparks.

From a media and communication perspective, this gap is significant. Digital platforms actively shape public discourse by amplifying content that generates high levels of engagement. User-generated posts frequently prioritize aesthetic appeal, personal experience, and emotional gratification, often overshadowing messages related to environmental stewardship and sustainability education (Modi et al., 2024; Wiedmann & Karampournioti, 2018). At the same time, algorithmic amplification privileges content that attracts likes, shares, and comments, systematically disadvantaging conservation-oriented communication that lacks immediate emotional or visual appeal (Gladwin, 2020). This condition produces a *visibility paradox*, in which conservation messages are most urgently needed in digital spaces where they are least likely to surface organically.

Understanding this paradox requires engagement with media and communication theories that explain how meaning, visibility, and attention are structured in digital discourse. Framing processes influence how issues are defined, prioritized, and interpreted by audiences, while platform logics shape which frames are amplified or marginalized. In sustainability-oriented contexts, the interaction between framing strategies and engagement-driven platforms becomes a critical determinant of whether conservation narratives remain peripheral or gain public traction. Yet empirical studies that systematically examine these dynamics within UNESCO Global Geoparks remain limited, particularly those that integrate quantitative patterns of visibility and engagement with qualitative insights into communicative framing.

Addressing this gap, the present study investigates social media discourse surrounding Ijen UNESCO Global Geopark, Indonesia, as a case study of mediated sustainability communication. By situating the analysis within media and communication scholarship on framing and digital visibility, this study seeks to clarify how conservation narratives are negotiated within tourism-oriented social media environments.

### 1.1 Literature Review

Scholarly attention to social media has increasingly emphasized its role as a mediated space where meanings are produced, circulated, and contested rather than merely transmitted. Within tourism and sustainability contexts, social media platforms function as arenas of narrative competition in which economic, cultural, and environmental interests intersect. Previous studies have shown that digital platforms profoundly shape how destinations are represented, privileging certain narratives while marginalizing others through both user practices and platform logics (Gössling, 2021; Munar & Jacobsen, 2014).

Framing theory provides a central analytical lens for understanding these processes. As conceptualized by Entman (1993), framing directs audience attention by emphasizing particular aspects of reality, defining problems, assigning responsibility, and suggesting solutions, while downplaying alternative interpretations. In tourism communication, framing determines whether destinations are perceived primarily through lenses of leisure consumption, cultural authenticity, or environmental value. Empirical studies demonstrate that dominant tourism frames often foreground experiential enjoyment and aesthetic appeal, shaping public understanding of destinations in ways that may obscure conservation responsibilities (Pearson et al., 2016).

In digital environments, framing processes are intensified by the participatory and algorithm driven nature of social media. User-generated content plays a decisive role in shaping destination narratives, often privileging visually appealing and emotionally engaging representations over informational or educational content (Šmelhausová et al., 2022). Platforms such as Instagram and YouTube tend to amplify highly aestheticized imagery and experiential storytelling, reinforcing leisure-oriented frames that attract attention and engagement. Conversely, text-oriented platforms such as X (formerly Twitter) are more conducive to issue-based communication, advocacy, and policy-oriented discourse, including discussions related to environmental protection and conservation (Santos-Souza & Nascimento-Dias, 2023; Wu et al., 2020). These platform specific affordances indicate that framing strategies are not neutral but closely intertwined with technological and algorithmic conditions.

Recent scholarship has further highlighted the concept of algorithmic framing to describe how platform architectures and engagement metrics shape content visibility independently of communicative intent (Daume et al., 2023). In this context, frames are not produced solely by human actors but are co-constructed through algorithmic systems that prioritize content likely to generate interaction. Such dynamics pose particular challenges for sustainability communication, as conservation narratives often lack the immediate emotional or visual appeal favored by engagement-oriented algorithms. As a result, conservation messages risk being systematically marginalized within digital tourism discourse.

These challenges are especially salient for UNESCO Global Geoparks, which are designed as integrated models of sustainable development combining geological conservation, education, and socio-economic development through tourism (Stoffelen, 2020; Xu & Wu, 2022). While geoparks are frequently described as living laboratories of sustainability, much of the existing literature approaches them from perspectives of tourism management, destination branding, or governance. Less attention has been paid to how geopark values are communicated and negotiated within social media discourse, particularly in relation to competing frames of tourism promotion and conservation responsibility.

Research on sustainable tourism communication suggests that visual storytelling and influencer driven content strongly shape destination image and travel behavior (Djafarova & Rushworth, 2017; Fox et al., 2020). Although such content enhances visibility and stimulates tourist interest, it can also produce imbalanced representations that prioritize economic and experiential narratives over environmental and educational objectives (Gössling, 2021). At the same time, studies indicate that conservation messages can achieve greater resonance when framed through cultural narratives, local community voices, and emotionally engaging storytelling that fosters authenticity and trust (Bhatt & Dani, 2024; Carvajal-Aparicio et al., 2024).

Nevertheless, significant psychological and social barriers constrain the circulation of conservation narratives in digital spaces. Users tend to favor positive and aspirational content that supports self-presentation and social approval, such as scenic landscapes or lifestyle-oriented travel experiences (Fergie et al., 2016; Neubaum & Krämer, 2017). By contrast, content emphasizing environmental threats may evoke eco anxiety and reduce willingness to engage or share (Elgaaied-Gambier & Mandler, 2021). The rise of influencer culture further reinforces the dominance of aesthetic and experiential frames, narrowing the discursive space available for educational or conservation focused communication (Panopoulos et al., 2022).

Strategic communication scholarship therefore underscores the importance of reframing conservation narratives to align with platform affordances and audience motivations. Emotional storytelling has been shown to enhance empathy and engagement by connecting environmental issues to personal experience (Amado Mateus & Juarez Acosta, 2022; Asplund, 2011). Humor and creative formats can reduce resistance to environmental messaging while improving recall and sharing (Jürgens & Stark, 2022). Interactive approaches, including gamification and immersive digital experiences, have also been identified as effective tools for sustaining attention and encouraging participation (Damaševičius & Sidekerskienė, 2024). Importantly, amplifying community voices through local narratives not only strengthens authenticity but also positions communities as active custodians of heritage rather than passive tourism objects (Abdul Halim & Ishak, 2017; Helmi et al., 2024).

Taken together, existing literature highlights the growing importance of framing and platform logics in shaping sustainability communication on social media. However, empirical research that systematically examines how conservation, education, and development narratives are framed, distributed, and engaged with across social media platforms particularly within the context of UNESCO Global Geoparks remains limited. This gap underscores the need for studies that integrate media and communication perspectives with empirical analysis of digital discourse, providing a foundation for examining the visibility paradox that characterizes conservation communication in tourism-oriented social media environments.

### *1.2 Research Gap*

Although scholarly interest in social media and sustainable tourism has grown substantially, significant gaps remain in understanding how UNESCO Global Geoparks are communicated within digital media environments. Existing research has predominantly focused on destination branding, technological innovation, and community engagement (Bhatt & Dani, 2024; Carvajal-Aparicio et al., 2024; Khan et al., 2025). However, there is limited empirical evidence on how the core pillars of Geoparks conservation, education, and sustainable development are framed and made visible within social media discourse.

Previous studies consistently demonstrate that user-generated content in tourism contexts prioritizes visual aesthetics and experiential appeal, often marginalizing conservation and educational narratives (Fox et al., 2020; Šmelhausová et al., 2022). While this pattern is well documented in general tourism research, few studies have systematically examined how such dynamics operate across different social media platforms in the specific context of UNESCO Global Geoparks. In particular, comparative analyses that assess how engagement patterns vary between conservation oriented and tourism-oriented content remain scarce.

Moreover, although strategic communication scholarship highlights the potential of framing, storytelling, and community-based narratives to enhance the visibility of sustainability messages (Abdul Halim & Ishak, 2017; Amado Mateus & Juarez Acosta, 2022; Entman, 1993), the application of these approaches to Geopark related digital discourse has received limited empirical attention. As a result, there is insufficient understanding of how conservation narratives can be effectively integrated into engagement-driven and algorithmically structured media environments without being overshadowed by tourism promotion.

This study addresses these gaps by examining social media discourse surrounding Ijen UNESCO Global Geopark, Indonesia, through a mixed methods approach. Specifically, it aims to (1) analyze how the three Geopark pillars are framed and distributed across social media platforms; (2) compare audience engagement patterns between conservation oriented and tourism-oriented narratives; and (3) identify communication strategies that enhance conservation visibility within algorithm driven digital environments. By doing so, the study contributes to media and communication scholarship by advancing empirical understanding of framing and visibility in sustainability communication, while also offering practical insights for policymakers, conservation managers, and communication practitioners seeking to balance tourism development with long term environmental stewardship.

### *1.3 Research Questions*

Based on the theoretical discussion and research gap outlined above, this study addresses the following research questions:

RQ1: How are UNESCO Global Geopark pillars conservation, education, and sustainable development framed and distributed in social media discourse?

RQ2: How do engagement patterns differ between conservation oriented and tourism-oriented content on social media platforms?

RQ3: What communication strategies enhance the visibility of conservation messages within engagement-driven digital environments?

## **2. Method**

### *2.1 Research Design*

This study employed a convergent mixed methods design (Creswell & Plano, 2017) to examine how conservation, education, and sustainable development narratives are represented and circulated within social media discourse surrounding Ijen UNESCO Global Geopark. This design integrates quantitative and qualitative approaches to capture both the distributional patterns of messages and the interpretive dimensions of how those messages are framed.

The quantitative component consisted of content analysis, which was used to measure the frequency, distribution, and engagement levels of UNESCO Global Geopark pillars across selected social media platforms. This approach enabled systematic comparison between dominant tourism-oriented narratives and less visible conservation-oriented content. The qualitative component involved thematic analysis to explore how meanings were constructed within posts, with particular attention to framing strategies, storytelling practices, and the interplay between promotional and conservation messaging.

Integration of the quantitative and qualitative strands occurred at the interpretation stage, where statistical patterns were examined alongside thematic insights to generate meta inferences. This convergence allowed the study to address the research questions with greater analytical depth and methodological validity.

### *2.2 Study Context*

The study focused on Ijen Geopark, officially designated as Indonesia's second UNESCO Global Geopark in 2023. Covering approximately 3,293 km<sup>2</sup> across the regencies of Bondowoso and Banyuwangi in East Java, the geopark encompasses diverse geological formations, ecological systems, and cultural landscapes. Its most iconic feature is the Blue Fire phenomenon at Kawah Ijen, a rare natural occurrence resulting from the combustion of sulfuric gases.

Beyond its geological significance, Ijen Geopark is closely associated with rich biodiversity and the Osing indigenous culture, whose language, rituals, and culinary traditions form an integral part of the geopark's heritage identity. Ijen was selected as the study site for two main reasons. First, as an emerging geopark in the early phase of international recognition, it provides a dynamic context for observing how promotional, conservation, and educational narratives evolve over time. Second, its strong visibility in tourism marketing and social media makes it an appropriate case for examining tensions between destination promotion, heritage preservation, and sustainability communication in digital environments.

### *2.3 Data Collection*

#### *2.3.1 Sampling Strategy*

A purposive sampling strategy was adopted to ensure that the collected data reflected social media discourse directly related to Ijen Geopark. Two platforms were selected based on their complementary communicative affordances. YouTube was chosen for its long-form audiovisual content and extensive user comment sections, which provide rich material for both quantitative engagement analysis and qualitative thematic interpretation. X (formerly Twitter) was selected for its role in facilitating real-time discourse, stakeholder interaction, and advocacy-oriented communication.

Only posts that explicitly referenced Ijen Geopark or associated keywords were included in the dataset. This criterion excluded unrelated tourism or environmental discussions and ensured a clear analytical focus on the study context.

### 2.3.2 Data Collection Procedures

Data collection was conducted in three sequential phases. In the first phase, a comprehensive keyword list was developed to capture both natural and cultural dimensions of the geopark. Primary keywords included “Ijen Geopark,” “Kawah Ijen,” and “Blue Fire,” while additional terms such as “Osing” and “geosite” were used to capture references to local culture and heritage. The sampling timeframe was set from 1 January 2021 to 15 September 2024, covering periods before and after UNESCO designation.

In the second phase, platform specific data collection procedures were applied. YouTube data were retrieved using the YouTube Data API v3, which provided metadata such as video titles, descriptions, view counts, likes, and user comments. Data from X were collected through Python based scraping using the tweepy library, capturing post content, timestamps, user identifiers, and engagement metrics including likes, reposts, and replies. The initial dataset consisted of 2,147 posts, which was reduced to 1,658 posts after removing duplicates and irrelevant content.

In the third phase, posts were categorized according to source type. Institutional sources ( $n = 539$ ) included content produced by government agencies, official tourism boards, conservation organizations, media outlets, and formal institutions. Personal social media content ( $n = 1,119$ ) consisted of posts generated by individual users, tourists, influencers, and community members. This categorization enabled comparative analysis between organizational communication strategies and grassroots digital narratives.

## 2.4 Data Analysis

### 2.4.1 Quantitative Content Analysis

Quantitative content analysis was conducted to examine the visibility and distribution of UNESCO Global Geopark pillars within social media discourse. A coding scheme was developed based on UNESCO’s conceptual definitions. Conservation referred to content emphasizing environmental protection, ecological value, or heritage preservation. Education included posts that conveyed scientific information, cultural learning, or knowledge dissemination. Sustainable development was operationalized through references to community empowerment, cultural heritage, and tourism or economic activities.

Two trained coders independently coded the dataset. Inter-coder reliability was assessed using Cohen’s kappa, yielding a coefficient of  $\kappa = 0.82$ , which indicates substantial agreement. Descriptive statistics, including frequencies and percentages, were calculated to assess the prevalence of each pillar. Cross tabulations were used to compare institutional and personal sources, as well as to examine differences in engagement between conservation oriented and tourism-oriented content.

### 2.4.2 Qualitative Thematic Analysis

To complement the quantitative findings, qualitative thematic analysis was conducted following the six-phase framework proposed by (Braun & Clarke, 2006). The analysis began with familiarization through repeated reading of the data, followed by the generation of initial codes capturing recurring ideas and narrative patterns. These codes were then organized into candidate themes, such as tourism promotion, conservation marginalization, and cultural identity.

Themes were reviewed to ensure internal coherence and clear distinctions before being defined and named. NVivo 12 software was used to support coding, organization, and visualization of themes. Particular attention was given to framing strategies, including whether conservation was portrayed as a responsibility, a threat, or an opportunity, and how conservation narratives intersected with tourism promotion and cultural storytelling.

## 2.5 Ethical Considerations

The study analyzed publicly available social media content and did not involve direct interaction with users. In accordance with established ethical guidelines for digital research, user consent was not required. Nevertheless, measures were taken to protect privacy and minimize potential harm. Usernames and identifiable information were anonymized, and direct quotations were paraphrased or reported only in aggregated form. Content containing sensitive personal information was excluded from analysis.

The research protocol received institutional ethical clearance and adhered to the Association of Internet Researchers (AoIR) ethical guidelines. Data collection complied with platform terms of service and was conducted with careful consideration of ethical responsibility in digital communication research.

## 3. Results

### 3.1 Distribution of UNESCO Global Geopark Pillars in Social Media Discourse

Analysis of 1,658 social media posts reveals a pronounced imbalance in the representation of the three core pillars of UNESCO Global Geoparks conservation, education, and sustainable development across both institutional and personal communication. Table 1 summarizes the distribution of content by pillar and source type.

Table 1. Distribution of Content by UNESCO Global Geopark Pillar

| UNESCO Pillar           | Institutional (n=539) |      | Personal (n=1,119) |      | Total (n=1,658) |      |
|-------------------------|-----------------------|------|--------------------|------|-----------------|------|
|                         | n                     | %    | n                  | %    | n               | %    |
| Conservation            | 12                    | 2.2  | 13                 | 1.2  | 25              | 1.5  |
| Geological heritage     | 7                     | 1.3  | 4                  | 0.4  | 11              | 0.7  |
| Environmental concerns  | 5                     | 0.9  | 9                  | 0.8  | 14              | 0.8  |
| Education               | 31                    | 5.8  | 29                 | 2.6  | 60              | 3.6  |
| Scientific information  | 20                    | 3.7  | 15                 | 1.3  | 35              | 2.1  |
| Cultural education      | 11                    | 2.1  | 14                 | 1.3  | 25              | 1.5  |
| Sustainable Development | 330                   | 61.2 | 1,028              | 91.9 | 1,358           | 81.9 |
| Community empowerment   | 6                     | 1.1  | 15                 | 1.3  | 21              | 1.3  |
| Cultural heritage       | 35                    | 6.5  | 316                | 28.2 | 351             | 21.2 |
| Tourism/economic        | 289                   | 53.6 | 697                | 62.3 | 986             | 59.5 |
| Governance              | 166                   | 30.8 | 49                 | 4.4  | 215             | 13.0 |

The findings show that sustainable development overwhelmingly dominates the discourse, accounting for 81.9% of all posts. Within this pillar, tourism and economy related content is the most prevalent (59.5%), underscoring the centrality of promotional narratives in both institutional and personal communication. Cultural heritage content also receives notable attention (21.2%), particularly among personal users who frequently highlight Osing traditions, festivals, and culinary practices. In contrast, community empowerment a key component of sustainable development appears in only 1.3% of posts, indicating that social and economic sustainability narratives are marginal relative to tourism promotion.

The conservation pillar is the least visible, representing only 1.5% of total content. Mentions of geological heritage (n = 11) and environmental concerns (n = 14) are minimal, suggesting that the ecological mandate of UNESCO Global Geoparks is largely absent from social media discourse. Even institutional accounts devote only 2.2% of their posts to conservation related themes.

Education related content is similarly underrepresented, comprising just 3.6% of total posts. Scientific information such as explanations of the Blue Fire phenomenon appears sporadically, while cultural education related to local language and traditions is even less frequent. These findings indicate that the educational function of Geoparks as “living classrooms” is not fully realized in digital communication spaces.

Governance related content accounts for 13% of the dataset and is concentrated primarily within institutional communication. Such posts typically focus on policy announcements, international cooperation, and the formal recognition of Ijen as a UNESCO Global Geopark.

Overall, these results reveal a clear thematic imbalance in social media discourse. Conservation and education pillars, which are central to UNESCO’s vision, are substantially overshadowed by tourism-oriented narratives. This pattern provides empirical support for the existence of a visibility paradox, whereby the content most critical to sustainability and environmental stewardship receives the least representation in digital communication.

### 3.2 Engagement Patterns across Tourism and Conservation Oriented Content

Engagement analysis further highlights disparities between tourism-oriented and conservation-oriented narratives. Tourism related posts consistently generate higher levels of interaction in the form of likes, comments, and shares across both platforms. Posts featuring scenic imagery, visitor experiences, and cultural performances attract immediate audience attention and are widely circulated, particularly within personal social media accounts.

In contrast, conservation focused posts receive substantially lower engagement. Even when conservation content is produced by institutional actors, interaction levels remain limited, indicating that institutional authority alone does not guarantee visibility in engagement-driven environments. Education related posts similarly attract modest interaction, especially when framed in technical or informational terms.

However, posts that combine tourism or cultural appeal with conservation messaging tend to perform better than conservation only content. This suggests that hybrid narratives, which embed conservation within experiential or cultural frames, are more likely to resonate with audiences and generate engagement. The engagement gap observed in this analysis reinforces the earlier finding that algorithmic and audience dynamics favor visually appealing and emotionally accessible content over informational sustainability messaging.

### 3.3 Framing Strategies in Conservation Discourse

Although conservation related posts constitute a small proportion of overall discourse, qualitative thematic analysis reveals three dominant framing strategies through which conservation narratives are articulated.

**Theme 1: Preserving Natural Wonders**

The most common conservation frame presents Ijen's geological features particularly the Blue Fire phenomenon as extraordinary natural assets requiring protection. Posts within this theme often invoke UNESCO recognition to legitimize conservation efforts, framing preservation as both a responsibility and a privilege. While this framing achieves moderate engagement when paired with striking visuals, it generates limited dialogue and interaction compared to tourism-oriented content.

**Theme 2: Community as Guardians**

A more resonant frame emphasizes the role of local communities, particularly the Osing people, as custodians of the environment. Posts highlighting traditional practices, forest protection, and sustainable livelihoods receive higher engagement than purely institutional conservation messages. By foregrounding lived experience and cultural authenticity, this framing enhances audience trust and emotional connection, making conservation narratives more relatable and engaging.

**Theme 3: Balancing Development and Protection**

The third theme, primarily evident in institutional communication, focuses on managing the tension between tourism growth and ecological sustainability. These posts emphasize visitor management, carrying capacity, and sustainable governance. Despite their conceptual importance, such managerial and technical frames attract relatively low engagement, suggesting limited emotional resonance in social media contexts.

Across all themes, a consistent pattern emerges: conservation narratives gain greater visibility when integrated with cultural and emotional storytelling. Posts that humanize environmental stewardship and link conservation to shared identity perform better than those relying solely on technical explanations or institutional authority. Conversely, highly managerial or abstract framings struggle to gain traction in attention driven digital environments.

**4. Discussion**

The findings of this study carry important implications for how conservation messages can be communicated more effectively within tourism-oriented digital environments. Rather than competing directly with dominant tourism narratives, conservation communication appears to gain greater visibility when it is strategically integrated into frames that already attract audience attention. This supports approaches often described as *stealth conservation*, whereby environmental messages are embedded within popular tourism, cultural, or experiential narratives (He et al., 2024; Pape, 2017).

First, conservation messages benefit from alignment with platform affordances. Visually oriented platforms favor aesthetic storytelling, suggesting that ecological information may reach wider audiences when paired with compelling imagery and experiential narratives. In this context, natural spectacles such as the Blue Fire can serve as entry points for communicating geological vulnerability and environmental stewardship. Embedding conservation within visually engaging tourism narratives allows sustainability messages to benefit from algorithmic amplification while retaining their substantive content (Dai et al., 2025; Montana & Mlambo, 2019).

Second, the amplification of local community voices emerges as a particularly effective communication strategy. Content portraying the Osing community as custodians of both cultural and environmental heritage generated stronger engagement than institutional conservation messaging. This finding aligns with participatory communication perspectives, which emphasize the credibility and emotional resonance of locally grounded narratives (Abdul Halim & Ishak, 2017; Bennett & Segerberg, 2012). Positioning communities as active stewards rather than passive beneficiaries can enhance authenticity and foster stronger audience identification with conservation values.

Third, emotional storytelling plays a critical role in bridging the gap between conservation knowledge and public engagement. Posts that connected geological features to human experiences, collective identity, or cultural continuity elicited more interaction than purely technical explanations. Consistent with narrative transportation theory (Dahlstrom, 2014; Green & Brock, 2000), emotionally immersive narratives appear more capable of sustaining attention and encouraging engagement in attention driven media environments.

Taken together, these implications suggest that effective conservation communication in UNESCO Global Geoparks requires a strategic reorientation rather than increased message volume. By embedding conservation themes within culturally meaningful, emotionally resonant, and platform compatible narratives, communicators can mitigate the visibility paradox identified in this study. Such an approach enables conservation to circulate within dominant tourism discourse without being eclipsed by it, supporting more balanced digital representations of sustainability-oriented destinations. This pattern mirrors broader challenges identified in other domains of mediated public communication, where algorithmic visibility consistently outweighs ethical or educational priorities unless strategically embedded within dominant narrative forms (Atnan & Imran, 2025; Sari et al., 2025).

## 5. Conclusion and Implications

This study examined how conservation, education, and sustainable development the core pillars of UNESCO Global Geoparks are framed and made visible within social media discourse, using Ijen UNESCO Global Geopark as a case study. The findings reveal a pronounced imbalance in digital representation: tourism-oriented narratives dominate social media communication, while conservation and educational content remain marginal. This disparity reflects a broader visibility paradox, whereby messages most critical for long term sustainability are least likely to gain attention within engagement-driven digital platforms. This pattern mirrors broader challenges identified in other domains of mediated public communication, where media visibility is structured by framing and agenda setting processes that privilege conflict, spectacle, or institutional narratives over ethical, educational, or normative concerns (Jaber, 2024).

From a theoretical perspective, the study advances media and communication scholarship by extending framing theory into digitally mediated contexts. The findings demonstrate that framing processes are not solely shaped by communicators and audiences but are co-produced by platform architectures that privilege content aligned with algorithmic logics of visibility and engagement. By conceptualizing algorithms as active framing agents, this research contributes to a growing body of work that rethinks how meaning, attention, and power are distributed in digital discourse. In doing so, it highlights the need to integrate framing theory with platform studies to more fully account for the dynamics of sustainability communication in social media environments.

The study also offers important practical implications for strategic communication in sustainability-oriented destinations. Rather than positioning conservation as a competing narrative to tourism, the findings suggest that conservation messages are more likely to gain visibility when embedded within culturally meaningful, emotionally resonant, and visually engaging narratives. Amplifying local community voices, particularly those of indigenous and resident groups, emerges as a powerful strategy for enhancing credibility and audience engagement. Emotional storytelling that connects environmental protection to shared identity, heritage, and collective responsibility further strengthens the communicative impact of conservation messages.

For geopark managers, policymakers, and communication practitioners, these insights underscore the importance of adapting conservation communication to platform-specific affordances without diluting its normative goals. Strategic integration rather than increased message volume appears key to mitigating the visibility paradox. By aligning conservation narratives with dominant modes of digital storytelling, UNESCO Global Geoparks can better balance their dual mandates of tourism promotion and environmental stewardship in increasingly competitive attention economies.

Despite its contributions, this study is not without limitations. The focus on two social media platforms and a single geopark context constrains the generalizability of the findings, and engagement metrics capture only surface level interaction rather than deeper attitudinal or behavioral change. Future research could extend this work through cross platform and cross-cultural comparisons, longitudinal analyses of discourse before and after UNESCO designation, and experimental studies testing the persuasive effects of different framing strategies.

Overall, this research demonstrates that the challenge facing conservation communication in digital spaces is not merely one of exposure but of strategic alignment with the communicative logics of social media. By reframing conservation as an integral component of culturally and emotionally compelling narratives, sustainability-oriented destinations can transform tourism dominated digital spaces from obstacles into vehicles for environmental responsibility.

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## Author contributions

Sarwititi Sarwoprasodjo: contributed to conceptualization, study design, supervision, data analysis, drafting, and critical revision of the manuscript. Anisa Nurkasanah: contributed to data collection, data analysis, drafting, and revision of the manuscript. Frisca Aulia Syifa: contributed to data collection, data analysis, project administration, and manuscript drafting. Yumelda Sari: contributed to data collection, data management, and manuscript revision. All authors read and approved the final version of the manuscript.

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## Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.



### Informed consent

Not applicable. The study analyzed publicly available social media content and did not involve direct human participation. No personally identifiable information was collected beyond publicly accessible data, and all ethical standards for observational digital research were followed.

### Ethics approval

This study received ethical approval from the Ethical Committee on Social Studies and Humanities, National Research and Innovation Agency (BRIN), Indonesia (Approval No. 825/KE.01/SK/10/2024), with a research period from October 2024 to September 2025. The study complied with national ethical standards, including data confidentiality and responsible research practices. All data analyzed were publicly available, and no direct interaction with human participants was involved.

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

### Data sharing statement

No additional data are available.

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