Visual Impacts of Informal Activities on Non-Urban Roadside Scenic Landscapes: A Case Study of Rawana Ella, Sri Lanka

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Abstract

The rise of non-urban scenic hotspots within tourist development corridors in Sri Lanka has led to increasing informal developments and user behaviors occurring outside formal landscape planning. These include unpermitted recreation, roadside vending, temporary structures, and informal parking, especially in visually attractive roadside locations. While such practices reflect public engagement with the landscape, they may also produce unintended consequences for scenic quality. This research aims to assess the impact of informal user behaviors and structures on the landscape visual quality of non-urban roadside scenic hotspots, focusing on Rawana Ella, Sri Lanka. Guided by three objectives: to identify informal activities, analyze their visual impact, and assess public perception a mixed-method approach was implemented using photographic surveys and visitor perception studies. Analysis based on complexity, coherence, and impression power revealed that informal activities increase visual clutter and reduce coherence, though natural features retain strong aesthetic appeal. Visitor surveys indicate that while the waterfall and forest canopy enhance the visual experience, unplanned structures disrupt clarity and memorability. The study highlights how informality influences visual quality in scenic sites and emphasizes the need for sensitive design interventions that balance public use with the preservation of scenic character

Keywords Non-urban landscapes, Scenic Hotspots, Informal Developments, Landscape visual quality, Informal user behavior

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Introduction

Roadside scenic sites outside urban contexts are increasingly undergoing informal occupation, particularly in tourist destination corridors where remarkable natural features invite the use of the public. In Sri Lanka, such roadside sites have developed outside the realm of formal landscape frameworks, leading to informal practices as vending, temporary constructions, and parking. While informal user occupancy is evidence of a complex relationship between the public and landscape, it also contributes to issues of visual quality. Specifically, informal practices increase visual complexity through the introduction of a heterogeneous visual assembly, disrupt visual coherence by disbanded forms, and reduce the overall impression capacity of scenic settings by weakening memorability and clarity of experience. Though the interest in these transformations is increasing, the topic of informality has rarely been addressed within the literature of landscape architecture with relation to visual characteristics in non-urban scenic environments. This study addresses this gap by looking into the case of Rawana Ella, a major roadside waterfall attraction in Sri Lanka that has undergone substantial informal development. Using a mixed-method approach, the research draws on photographic surveys and visitor perception to investigate the impact that informal user behaviors have on visual complexity, coherence, and impression power.

The current investigation is framed around the key question; how does informal user behavior and development influence the visual quality of non-urban roadside scenic hotspots. The research focused on three objectives which to establish informal user behavior at the case site, to evaluate its influence on complexity and coherence, and how visitors perceive impression power. By furthering the understanding of visual implications of informal user behaviors in non-urban contexts, this investigation makes contributions to theoretical conversations and practice for scenic landscapes - balancing use and aesthetics.

Literature review

Concept of Informality

Informality refers to space, behaviors, and systems that develop outside of formalized governance systems and planned frameworks. It includes unplanned developments within urban and rural environments, that were built or established, absent of formal rules, building codes or systems of state management (The Unplanned City, n.d.). AlSayyad, Roy, Dovey, and others, however, argue that informality is not fundamentally disorderly or to be misconstrued as outlaws, but is a fluid, flexible framework that humanizes the structural regulation of the city and is responsive to human need, economic pragmatism, and social-spatial improvisation (The Unplanned City, n.d.). This understanding of informality suggests an alternative spatial logic that is established from the bottom up, not from the top down.

Informal spaces and activities are typically confined to high foot or transition space such as streets or sidewalks, or public, scenic places, and may include any other street vending, temporary market, resting area, or informal gatherings (Gerxhani, 2004; Sibhat, 2014; Zheng et al., 2016). Like most definitions, there is no concise, universal explanation for informal development, but scholars in the field recognize the multifaceted nature of informality including spatial, economic, regulatory, and cultural dimensions (Meager, 2013; Hart, 1973). Although there exists some conceptual ambiguity with respect to informality, it can be useful as an analytical lens to witness forms of spatial capital, concept of value, that exist from the notion of formalism.

Informality in Planning and Landscape Contexts The connection between informality and planning has undergone significant changes. For a long time, informality was considered “unplannable” because it could not be organized in a traditional manner and was unable to fit into formal regulatory frameworks. Today, however, we recognize how informality can offer new forms of innovation and spark creativity in planning and landscape design (Yiftachel et al, 2021). Informal practices provide an alternative spatial logic to understand social and economic needs, reframing how we think about planning and moving us into a transition stage where we re-planning informally, meaning we consider how to insert that informality back into the spatial environment.

Urban Informal Spaces

Urban informal spaces are not just random occurrences in the city, they are built into the functioning of cities, particularly in settings where power and access to resources is unequal. Informal urban spaces emerge through social, economic and geographical forces that influence the experience of urban life and include informal settlements and informal urban green space as two categories of urban informality.

Informal urban settlements, often referred to as slums or squatter settlements, represent one of the most visible manifestations of urban informality. Rooted in global housing crises and unequal land distribution, these settlements are typically built without legal tenure or formal planning authority (Roy et al., 2003; UN-HABITAT, 2006). Far from being temporary or chaotic, they are enduring socio-spatial formations shaped by incremental development and negotiation (Portes & Perlman, 1977). As Roy (2005) argues, informality operates both beyond and within state control, sometimes tolerated as a means of absorbing social and economic pressures. These spaces blur distinctions between public and private realms, generating unique urban morphologies and adaptive forms of living (McFarlane & Waibel, 2012). Contemporary planning discourse increasingly recognizes informality as not just a challenge to governance but also as a lens for achieving spatial justice and inclusive design (Rafieian & Kianfar, 2023).

Informal Urban Green Spaces

Parallel to settlements, informal urban green spaces (IGS) represent another critical expression of informality in cities. Unlike formally managed parks or gardens, IGS consist of neglected, vacant, or residual lands that have been reclaimed by vegetation and informally appropriated by people for recreation, rest, or social interaction (Rupprecht et al., 2015a; Del Tredici, 2010; Kowarik, 2018). Emerging on brownfields, roadside verges, and rail corridors, these spaces provide essential ecological and social functions that formal green spaces may overlook. Despite their value, they are often dismissed as “empty” or “wasted” lands and threatened by redevelopment pressures (Rupprecht et al., 2015a; Długoński & Dushkova, 2021). Scholars such as Rupprecht and Byrne (2014) describe IGS as liminal, quasi-public landscapes shaped by human disturbance and informal appropriation. Their recognition within planning and landscape discourse underscores the need to integrate socioecological resilience and everyday lived experiences into urban design practice.

Informality in Rural and Non-Urban Contexts

While urban informality has received extensive academic attention, informal practices in rural or non-urban contexts remain underexplored. Existing literature tends to focus on urban peripheries or post-industrial zones (Rupprecht et al., 2015a; Sikorska et al., 2020), overlooking spontaneous spatial practices in natural or scenic rural environments. Yet, informality also emerges in these settings through unregulated recreational use, informal roadside stops, and scenic viewpoints formed by repeated public behavior. Such spaces, though not formally planned, evolve into public landscapes that reflect human interaction with nature. The absence of design intervention, however, often leads to ecological degradation and visual disturbance. Addressing this gap, recent research including the present study extends the informality discourse beyond cities to examine how informal spatial practices shape the visual and ecological character of non-urban landscapes.

Landscape Visual Quality

Landscape visual quality is the perceived aesthetic value of a landscape developed from both natural and cultural features and as a human perceptual reality which also considers experience and cultural context (Arriaza et al., 2004; Milcu et al., 2013). High landscape visual quality contributes value to cultural ecosystem services, identity, and wellbeing. Measuring visual quality combines objective and subjective approaches, including a set of measurable constructs indicating the visual quality of landscapes, complexity, coherence, interference to coherence, stewardship, naturalness, and impression power (Surová et al., 2013).

Rural scenic landscapes are extremely sensitive to informal development, as unregulated activities can disrupt visual coherence, diverge from natural color palettes and lessen the aesthetic experience. Measuring visual quality through quantitative measures and qualitative scales of visitor perceptions produces a layered understanding of influences of both ecology and visual integrity through informal structures.

Methodology

This research addresses the increasing appropriation of scenic non-urban roadside hotspots through informal behaviors and unplanned developments, which, although socially and culturally significant, remain insufficiently examined in relation to their visual consequences. Accordingly, the study aims to assess the impact of informal user behaviors and structures on the landscape

visual quality of non-urban roadside scenic hotspots. Guided by the central research question; *"How do informal user behaviors impact the visual quality of non-urban roadside scenic hotspots?"*. The study is structured around three key objectives: to identify informal activities and unplanned developments occurring within selected sites; to analyze their effects on visual quality; and to evaluate public perception of the visual and functional implications of such informality. Complexity, interference to coherence and the impression power have been selected as most relevant measurable parameters to assess the impact on visual quality of the site. (Surová et al., 2013). The following section outlines the methodological framework adopted to achieve these objectives, emphasizing a context-specific and analytical approach.

The selection of the case study was based on four main parameters: its roadside location, its non-urban character, its high scenic visual quality, and its function as a popular stopover used spontaneously by travelers. Accordingly, the Rawana Ella area in Uva Province was chosen as the case study site. Located along the main Ella–Wellawaya road, this site exemplifies how informal public landscapes emerge at the intersection of accessibility and natural attraction. Its iconic waterfall, dramatic rock formations, and lush forest cover have made it one of the most photographed and visited scenic locations in the region (Uva Development Authority, n.d.). In the early 2010s, travel guides such as *Lonely Planet* described Ella as a "comfortable backpacker destination" along the Kandy–Badulla train route, highlighting its appeal as a scenic mountain retreat. With the later development of the Southern Highway and improved transportation access, Rawana Ella began to experience increased tourist visitation. This growth intensified informal activities such as roadside vending, temporary parking, and spontaneous recreation along the road margins near the waterfall. These informal practices, although not formally planned or managed, have contributed to the site's evolving identity as a public gathering space.

Data collection

The initial phase of the study focused on the identification of informal activities in the site context. Data collection was carried out combined approaches comprised of field observations and semi-structured interviews with visitors, shop owners and the residence community. In addition, data was collected through informal discussions with Ella local authority. These discussions contributed to developing the site's current management practices.

The second part was designed to examine how each of these informal activities affected the site's visual quality, looking at three visual quality assessing parameters consisting of complexity, interference to coherence, and impression power. Complexity and interference in coherence data were assessed using a photographic method. Four representative photos were taken capturing the entire site viewing the site from each of the four cardinal points of the compass. To gather data for the and Impression Power parameters, an open-ended questionnaire was administered to a random sample of visitors, including both local and foreign visitors to the site.

Data analysis

The data analysis process was structured in multiple phases to systematically interpret both spatial behavior and visual quality attributes of the study site. Each analytical method corresponded to a specific research objective and was selected to allow the integration of quantitative and qualitative data.

Identification of Informal Activities

Behavioral mapping was employed to document the spatial distribution, frequency, and intensity of informal activities occurring within the site. This method was selected for its ability to provide a systematic visual representation of how users occupy and interact with space. Data was collected through direct observation during multiple site visits, focusing on the identification of activity clusters and movement patterns. Locations with the highest frequency of parked vehicles, Points where visitors began walking after leaving vehicles, Concentrations of street shops and temporary stalls, and Areas where large groups gathered to view the waterfall were the indicators used to delineate the informal activity zones.

The spatial distribution of these activities was mapped to identify the informal activity core and its surrounding zones.

Categorization of Functional Zones

Following the behavioral mapping, functional zoning was conducted to classify observed activity clusters. The process involved grouping activities into three main use types as parking, street vending, and recreation and spatially locating them within the identified informal activity core. Thematic coding of field notes and interview transcripts supported this classification, enabling systematic organization of recurring themes, terminologies, and user behaviors.

Visual Quality Assessment

Visual complexity was measured using four representative site photographs captured from key roadside viewpoints (Figures 1.a–d). Each image was analyzed using Adobe Photoshop to extract grayscale pixel data. (Gosal & Ziv, 2020). Complexity was quantified by calculating the standard deviation of pixel grayscale values, which represents the tonal variation within an image. A higher standard deviation corresponds to a visually more complex scene.

To assess spatial variation in complexity across the site, descriptive statistics including mean, range, standard deviation (SD), and coefficient of variation (CV) were applied to the four derived values. This enabled comparison of visual heterogeneity across different sections of the site.

The parameter of interference to coherence was evaluated through color distribution analysis of the same four photographs. Using Adobe Photoshop, the proportion of dominant colors in each image was extracted and classified into color categories. These proportions were then used to calculate Shannon's Diversity Index (H) and Evenness (E), as per the following formulas:

$$H = -\sum(p_i \ln p_i)$$

$$E = H/\ln S$$

where p_i is the proportion of each color class and S is the total number of color classes.

Shannon's Index (H) measures overall diversity, while Evenness (E) evaluates the uniformity of color distribution. Low H and E values indicate visual coherence dominated by a few color tones, while high values suggest multiple competing colors leading to visual interference and fragmentation.

Semi-structured questionnaire responses were analyzed using thematic coding. Recurring patterns, sentiments, and descriptive terms were systematically grouped under emergent themes representing the impression power of the user about the site.

The scope of this research is confined to examining informal activities and their influence on landscape visual quality within a selected non-urban scenic site. The study focuses on understanding how unplanned human interactions shape aesthetic and perceptual dimensions of such landscapes, with particular emphasis on the parameters of complexity, coherence, and impression power. Methodologically, the research is limited by its single-case focus, which constrains the generalizability of findings to other contexts. In addition, the fieldwork was conducted within a restricted timeframe and with a limited sample size, which may not fully capture seasonal variations in visitor behavior or landscape change. Despite these limitations, the study provides valuable insights into how informal human use influences the visual and experiential quality of non-urban scenic landscapes, contributing to broader discussions on landscape management and design intervention.

Findings, Analysis and Discussion

After the analysis of the data, behavioral mapping revealed a spatial range which had a higher concentration of activities within the site. The range is identified with the high intensity of parking and intensity distribution of users in different functional zones based on activities within the site. (figure 2)

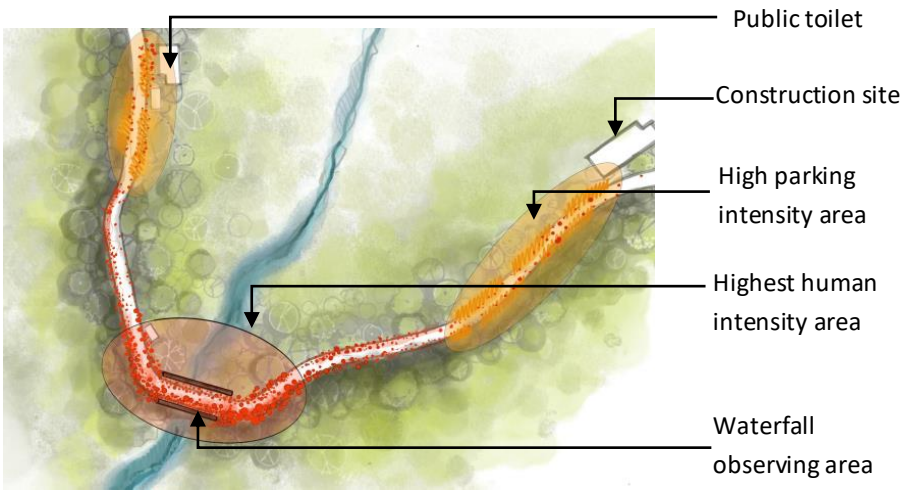

Fig. 2: Most intensively active areas within the site
Source: author

Through these observations, the spatial core of the informal activity was identified, which lay between two prominent landmarks: the public toilet and an ongoing construction site located near the waterfall and 50m off set from the main road line towards the conserved forest areas on either side of the road. This segment of the roadside, bound by the public toilet and the construction site, thus became the focal area for further study. (figure 3)

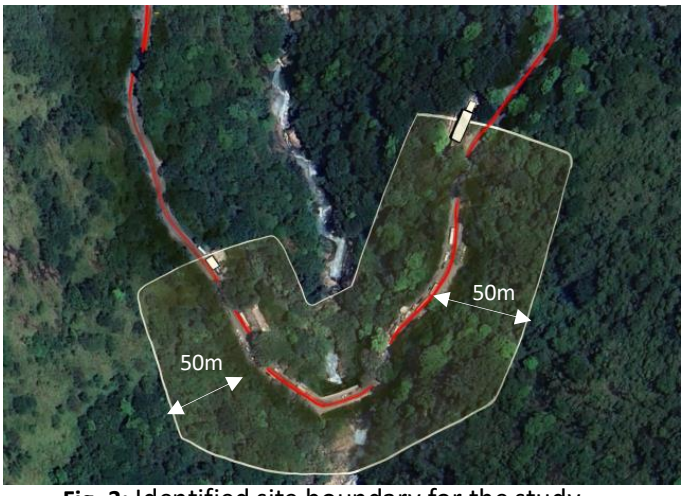

Fig. 3: Identified site boundary for the study
Source: author

Within this study area, behavioral mapping revealed the presence of five functional zones. Within the five zones activities that take place can be categorized under three broader types of use such as parking, street vending, and recreation. Two of the zones corresponded to parking, reflecting the heavy reliance on roadside vehicle stops, while two zones were with street vending, highlighting the prevalence of temporary or semi-permanent stalls. The final zone was a recreational area, primarily used by visitors as a viewing and gathering point to experience the waterfall. (figure 4)

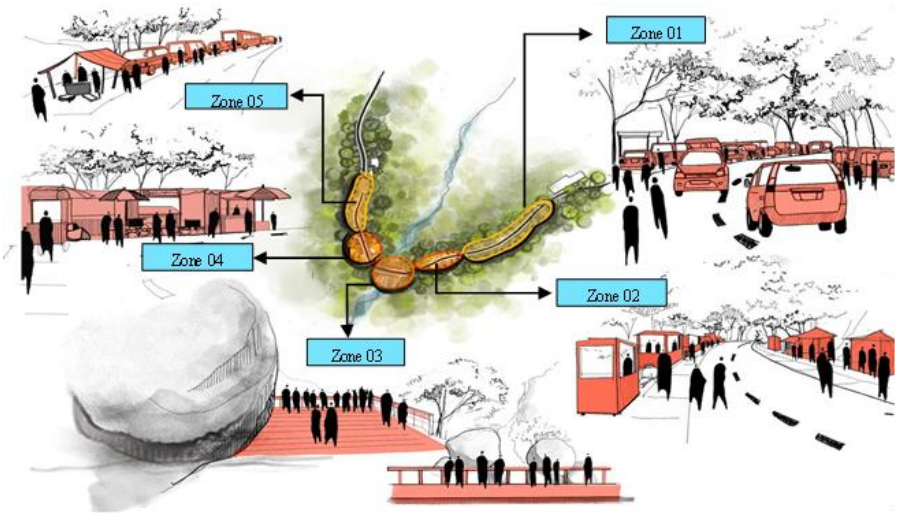

Fig. 4: Activities within the five functional zones
Source: author

Site users' interviews confirmed the functional mapping of results but also provided insights into how the participants perceived the activities. Thematic coding of the interview transcripts suggested two dominant forms of informal activity as roadside vending and roadside parking. (Table 1)

Table 1: Site-based identified activities

Theme	What it represents	Activities included
Informal Site-based Activities	Activities that are unregulated, lack formal approval, infrastructure, or management.	Informal vending (roadside shops) Informal parking (roadside parking)
Site-based recreational activities	Activities carried out by visitors for enjoyment or leisure which are not commercial or regulated.	Watching the waterfall Taking the photographs

Notwithstanding that both were common, vending structures emerged as the most spatially stable and visually effective element. Stalls typically founded with some inequitably arrangement of tin sheets, slap on tarpaulin coverings, and wooden scaffolding were placed directly on the roadside. Some were only temporarily sourced from polythene or fabric that were used during the day and removed if needed but ultimately dominated the visual aspect for patrons coming to the waterfall.

Roadside activity appeared fairly congested with parking alongside, it was found transient, with vehicles moving out on constant basis.

So, essentially, there are two basic layers of activities that could be recognized as static and dynamic with the existing roadside structures, parking and traffic.

The knowledge gained during this phase provides critical baseline awareness where the activity site is not only a natural scenic hotspot and as a constructed socially built landscape, through unregulated activity. Informal vending is a determinant outcome that enhances anticipated visual character of the site and thus will form the main aspect for further analysis.

Impact of the informal activities on the visual quality of the site

For the parameter of visual complexity, which was assessed quantitively, four representative photographs (figure 5.a, figure 5.b, figure 5.c, figure 5. d) got complexity scores as follows. (Table 2).

a b c d

Fig. 5: Selected photographs representing the informal activities within the site
(a – Informal vending structures, b – informal structures, c - road side parking and vending structures – roadside parking)
Source: author

Table 2: Complexity values

Figure number	Complexity scores
5.5. a	85.65
5.5. b	58.73
5.5. c	88.45
5.5. d	83.62

Statistical assessment of the scores developed an understanding of complexity at the site. The meaning of 79.11 represents that the site is, on average, visually complex. However, the range of 29.72, coupled with a standard deviation of 13.73 and coefficient of variation (CV) of 17.3%, suggests that there is considerable heterogeneity amongst views. Using the common heuristic CV scale from the ecological and landscape studies licensures, the site falls into the extreme range for “high dispersion” due to the CV dimensioning.

The visual complexity analysis to quantify tonal variation through pixel-based measures revealed that some parts of the site had markedly high levels of visual clutter in contrast to others. When these findings are compared with the documented behavioral mapping of activities across the area, some of the areas with high levels of complexity also overlapped with areas with high levels of informal parking and vendor stalls. Having more built environmental features with different forms, colors and shadows simply adds variables to the visual field that would increase tonal variance and decrease legibility.

The analysis empowerment noted that complexity not only relates to build and informal structures, the behavioral map indicates that the volume of traffic was also a fundamental variable that supports these conditions. Constant moving vehicles and clusters of vehicles along the roadsides make the view more complex to the eye in a more dynamic way. The forms, colors and the movement of the vehicles disrupt the natural backdrop of the view constantly. As a result, activity related to parking and circulation must be recognized as an essential to the variability of complexity of the site, though those factors were not actually separated as variables in the computational analysis.

The results highlight that greatly differing levels of complexity characterize the site, revealing the presence of patchy areas of visual disruption. The photographs with lower complexity values of 58.73 represent calmer areas where the natural elements prevail and views of vegetation and the waterfall were relatively uninterrupted. Photographs with higher complexity values of 88.45 illustrate the areas where vending structures, signage, and waste build-up contributed to clutter and visual intensity.

The findings illustrate that informal vending directly adds to visual complexity caused by the introduction of new layers of textural elements, materials, and colors, and consequently disrupted the natural scene. This patchy visual complexity illustrates the spatially localized hotspots of activity, where informal markets abounded in the foreground and competed with the natural scenic backdrop. Richness sometimes, richness of experience can progress with diversity in landscape elements, on this occasion the patchy unequal distribution produced complex visuals that detracted from the overall scenic quality of the site.

Coherence refers to the extent to which visual elements in a landscape are unified and harmonious. Interference to coherence was assessed through Shannon's Diversity Index (H) and Evenness (E), calculated from the distribution of dominant colors in the site photographs (figure 6). The analysis revealed consistently high values of interference across all four photographs, with scores ranging from 0.908 to 0.970 and an overall mean of 0.934.(figure 5)

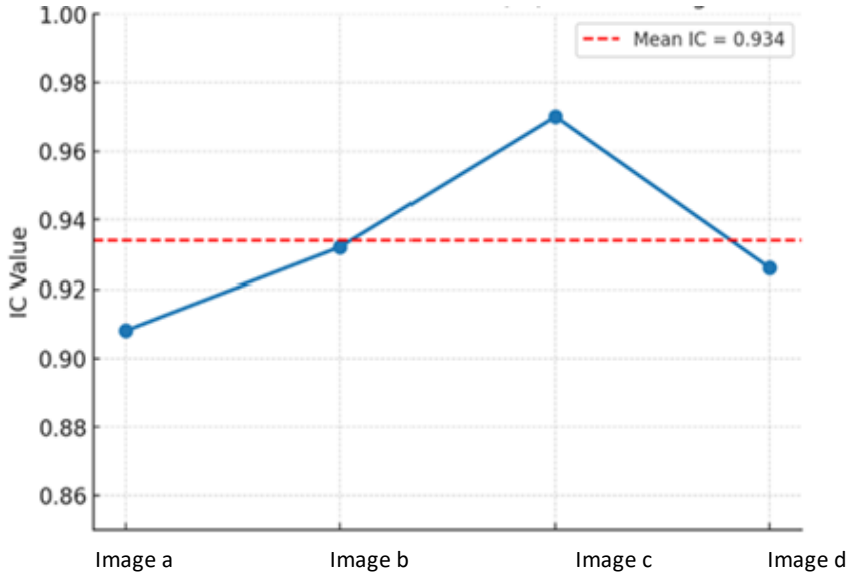

Fig.6: Values got for interference to coherence for selected photographs
Source: author

The high values of interference suggest that the site lacks visual coherence. In a coherent landscape, one would expect the dominance of a few natural colors such as greens, browns and blues, reinforcing the natural character of the site. Instead, the analysis revealed that no single set of visual elements dominate. Multiple colors, introduced primarily by vending stalls, tarpaulin sheets, plastic boards, and signages, compete equally for visual attention.

This fragmented distribution creates an unstable and visually noisy environment. For instance, while the natural backdrop of the waterfall and surrounding forest presents a consistent palette of greens, grays, and whites, these are interrupted by vibrant reds, yellows, and blues of vending stalls and advertisement boards. The evenness index values confirm that these disruptive colors are not isolated but evenly spread across the site, amplifying the lack of coherence.

As a result, the visual field becomes fragmented, diminishing the sense of unity and order that is often central to the experience of scenic landscapes. Visitors encountering this environment perceive not a continuous natural view but a disrupted scene where artificial elements dominate, competing with the natural backdrop rather than complementing it.

In addition to the influence of vending structures, informal parking and constant vehicular movement further intensify interference to the visual coherence as the random positioning of vehicles along both sides of the road disrupts the natural visual flow of the landscape. Unlike designated parking areas where vehicles can be visually contained, these scattered arrangements introduce irregular color blocks and reflective surfaces that continually change with vehicle turnover. The presence of diverse vehicle colors, shapes, and materials ranging from bright to dark adds to the chromatic and textural inconsistency of the scene.

The thematic analysis of visitor responses complicated the notion of impression power at Rawana Ella, revealing the interplay between the site's natural scenic qualities and visual disturbances caused by informal development. Across the questionnaires, almost all visitors cited the first impression of the site as memorable, indicating that the waterfall and its surrounding natural elements have a significant intrinsic scenic quality. Taken together, it can be confirmed that the site's high impression power is due to its natural focal points; meaning that the experience of the landscape is still focused on its intrinsic properties considering or despite informative structures.

The participants' responses about the impact of existing temporary structures were varied. Many participants indicated that the structures were distracting and detracted from their view while others indicated that they did not find them particularly distracting. The range of responses indicates that visual perception is subjective and that while informal structures may encroach on the experience for a small subset of visitors, the overall natural appeal of the site could allow others to see it as scenic.

With respect to site visual character preferences, visitors showed a strong preference for the space to remain as a natural rather than built space, and respondents responded that they valued preserving and drawing attention to existing vegetation, waterfall, and additional natural elements. A small number of respondents noted that the space did not require any change, or that there was nothing distinct there to draw attention to, showing variability in visitor experience expectations and perceptions.

Descriptions of the site as a scenery also convey the balance between the positive and negative experiences. Some communicated they could experience the natural scenery to the fullest without competing distractions, while others described how they struggled to appreciate the total experience because of informal and legal structures, crowds, and visual clutter. In relation to the discussion of attention when near the waterfall, most responders referred to natural elements having the most interest associated with attention, although a small portion stated crowds, vehicles, and human activity as competing visual stimuli. This shows the natural scenic elements keep a strong lead in the impression power, but human elements can influence the strength and clarity of that impression, near the waterfall.

Respondents who attended the site multiple times provided some understanding of temporal context, including some levels of development changes. Some visitors indicated that they did not notice any development of the site while others expressed that it included new additions, such as viewing decks or structures, that enhanced the experiential function, but not the aesthetic function. While additional functional development would increase physical engagement, it would not automatically translate to improved impression power aesthetic function unless it was integrated thoughtfully into the natural context.

Conclusion

This research demonstrates that informal practices at Rawana Ella, including unregulated structures and parking, have significantly affected the visual character and experiential quality of non-urban scenic hotspots. Quantitative and qualitative analyses consistently show that unmanaged activities increase visual complexity through irregular shapes, colors, and materials that conflict with the natural environment. This heightened complexity undermines the legibility of the site, reduces visual coherence, and disrupts the harmonious relationship between key natural elements such as the waterfall, forested slopes, and surrounding flora.

Visitor responses further highlight impression power as a critical measure of landscape quality. While Rawana Ella retains high inherent visual appeal, informal infrastructures and visual clutter diminish the clarity and strength of visitors' first impressions. The diversity in perceptions underscores the subjective nature of visual experience, yet the overall trend confirms that unmanaged visitor activity negatively affects both coherence and experiential value.

The findings emphasize the importance of landscape architecture interventions in mitigating these effects. Thoughtful design can reduce visual clutter, restore coherence, and reinforce impression power by organizing visitor activities, framing spectatorial views, and integrating structures sensitively into the context. On a broader scale, policies that regulate temporary developments and guide visitor management are essential to preserving the aesthetic, functional, and experiential value of scenic sites.

Future research should build on these findings by exploring informal practices across multiple non-urban scenic hotspots to assess the generalizability of the observed impacts. Longitudinal studies are needed to capture seasonal and temporal variations in visitor behavior and visual change. Additionally, research could examine the effectiveness of specific design interventions or policy measures in enhancing landscape coherence and experiential quality, as well as the interaction between ecological sustainability and aesthetic management. Such investigations would provide more comprehensive guidelines for balancing visitor use with the conservation of visual and perceptual qualities in non-urban landscapes.

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