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Pre-and post-cyclone tourist satisfaction at heritage destinations in Sri Lanka: A comparative study

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ABSTRACT

Climate-related hazard events can disrupt tourism systems and influence visitors' evaluations and destination recovery, particularly in the heritage-tourism context. Drawing on heritage-tourism satisfaction research and a disaster-risk-reduction perspective, this study examines tourist satisfaction at three Sri Lankan heritage destinations under contrasting pre- and post-cyclone conditions. Two independent cross-sectional surveys were conducted among international tourists before and after cyclone *Ditwah*, producing 346 valid responses. Descriptive analysis, chi-square tests, Two-Way Analysis of Variance, multiple regression and thematic analysis were employed. Existential authenticity, destination image, situational involvement and objective authenticity were positively associated with tourist satisfaction, whereas constructive authenticity was not statistically significant. The pre-cyclone indicator was positive and significant only at the 10% level, providing marginal evidence that satisfaction was slightly higher in the pre-cyclone sample. Qualitative responses indicated a shift from routine concern regarding information facilities and cleanliness toward infrastructure recovery, accessibility, safety and preparedness following the cyclone. The findings highlight the importance of preserving authentic heritage experiences while integrating visitor communication, accessibility, safety and disaster risk reduction into heritage-destination management.

1. Introduction

Tourism is one of the world's largest and fastest-growing economic sectors, contributing substantially to employment, foreign exchange earnings, regional development, and cultural preservation (UN Tourism, 2025; WTTC, 2025a, 2025b), Beyond its economic contribution, tourism also supports sustainable development by promoting cultural exchange, protecting heritage resources and creating livelihood opportunities for local communities. In Sri Lanka, tourism represents one of the country's major sources of foreign exchange earnings and has become increasingly important in supporting post crisis economic recovery (CBSL, 2025; International Development Group LLC (IDG), 2023). The continued growth of international arrivals has reinforced the strategic importance of maintaining destination attractiveness, visitor confidence and long-term resilience within the tourism sector. However, tourism is highly vulnerable to climate-related hazards. Increasing evidence suggests that the frequency and intensity of extreme weather events,

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including tropical cyclones, floods and prolonged rainfalls, are creating new challenges for tourism destinations worldwide. Such events interrupt transport systems, damage tourism infrastructure, reduce destination accessibility, alter visitors' perceptions of safety and delay post-disaster recovery (Rosselló et al., 2020; World Bank Group, 2025). From a disaster risk reduction perspective, tourism destination represents socio-economic systems in which visitor behaviour constitutes an important component of overall destination resilience. Consequently, understanding how tourists respond to climate-related hazards has become increasingly important for designing adaptive tourism management strategies and strengthening destination resilience. These climate-induced disruptions create cascading socio-economic consequences for tourism-dependent regions, highlighting the need for adaptive governance, resilience planning, and sustainable climate risk management strategies.

These challenges are particularly significant for heritage-tourism destinations. Unlike many other tourism products, heritage destinations derive their attractiveness from historical moments, cultural landscapes, symbolic meanings and visitors' emotional engagement with the destination (Domínguez-Quintero et al., 2020; Gao et al., 2020; Zhang et al., 2018). Tourist satisfaction in heritage-tourism therefore depends not only on the quality of physical facilities but also on visitors' perceptions of authenticity, cultural identity, emotional attachment, and experiential value. Cyclone-related hazards may disrupt these experiential dimensions by affecting destination accessibility, transport services, physical infrastructure, perceived safety, culture, atmosphere, and the perception of heritage resources. Consequently, the cyclone-related disruptions at heritage destinations may extend beyond physical damage and influence visitors' psychological evaluations, satisfaction, confidence, and future behavioural intentions.

Sri Lanka provides an important setting for examining these issues. The country possesses internationally recognised UNESCO World Heritage destinations including Sigiriya, Dambulla and Kandy which attract a substantial number of international tourists annually (SLTDA, 2025). During the 2025 tourism season, cyclone *Ditwah* affected several parts of the country, disrupting transport networks, tourism operations and access to major heritage destinations (Amaratunga and Kodituwakku, 2026; Fusion Media Limited, 2025; Star Media Group Berhad, 2025). The event provided a valuable setting in which to examine whether tourists' perceptions and satisfaction differ between the pre-and post-cyclone survey periods while heritage-tourism activities continued. Understanding these behavioural responses is particularly relevant for destinations seeking to balance heritage conservation with climate resilience tourism development.

Previous heritage-tourism research has consistently identified authenticity, destination image, visitor involvement, and experiential value as important determinants of tourist satisfaction (Domínguez-Quintero et al., 2020; Gao et al., 2020; Uslu et al., 2024; Zhang et al., 2021). In parallel, tourism-disaster research has focused strongly on destination vulnerability, tourist flows, infrastructure disruption, disaster management, recovery, and resilience (Filimonau and De Coteau, 2020; Jayasinghe et al., 2024; Liu-Lastres et al., 2020; Rosselló et al., 2020). Recent work further emphasises preparedness, collaborative governance, and the integration of disaster risk reduction into tourism planning (Amri et al., 2025; Jayasinghe et al., 2024). However, these bodies of literature remain only weakly integrated at the individual visitor level.

Consequently, an important empirical and conceptual gap concerns how established heritage-tourism experience factors are associated with satisfaction when visitors evaluate destinations under environmentally disrupted conditions. This gap matters because post-disaster tourism recovery involves more than restoring physical infrastructure; it also requires the maintenance of visitor confidence, accessibility, safety, experience quality, and the cultural and symbolic value of the destination. The present study addresses this issue by comparing tourist evaluations across contrasting pre- and post-cyclone survey periods while linking heritage-tourism experience research with a disaster-risk-reduction perspective.

The unresolved issue is therefore not merely whether cyclone-related disruption is associated with changing average satisfaction, but whether the cultural, symbolic, and experiential foundations of heritage-tourism satisfaction remain influential under disrupted destination conditions.

Drawing on heritage-tourism satisfaction research and a disaster-risk-reduction perspective, this study examines whether tourist satisfaction and heritage-tourism evaluations differ between the pre- and post-cyclone survey periods. Expectation-Disconfirmation Theory (EDT) is retained only as a supplementary satisfaction perspective because the study does not measure within-person expectation-experience gaps (Oliver, 1980). It also evaluates the relationship of objective authenticity, existential authenticity, constructive authenticity, destination image and situational involvement with tourist satisfaction. Rather than focusing solely on macro-level tourism outcomes, the study adapts a micro-level behavioural perspective and examines tourist evaluations under contrasting environmental conditions. In doing so, it contributes to the heritage-tourism climate risk management literature by incorporating behavioural dimensions into the analysis of destination resilience and recovery.

Accordingly, this study examines whether tourist evaluations of authenticity, destination image, situational involvement and overall satisfaction differ between pre-and post-cyclone survey periods. It also evaluates the extent to which objective authenticity, existential authenticity, constructive authenticity, destination image and situational involvement explain tourist satisfaction. The objective of this study is to examine tourist satisfaction at Sri Lankan heritage destinations under contrasting pre-and post-cyclone conditions and to evaluate the relationship between heritage-tourism experience factors and tourist satisfaction. The study addresses the three research questions: (1) How do tourists' evaluations of heritage-tourism experience and satisfaction differ between the pre- and post-cyclone periods? (2) To what extent do the selected heritage-tourism experience factors explain tourist satisfaction? and (3) What implications do these behavioural patterns have for heritage-tourism management, disaster risk reduction and destination resilience?

The study makes three contributions. First, rather than proposing authenticity, destination image, or situational involvement as new predictors of satisfaction, it examines whether these established heritage-tourism experience factors remain relevant under contrasting pre- and post-cyclone conditions. Second, it connects micro-level visitor evaluations with disaster-risk-reduction research that has more often emphasised destination-level vulnerability, recovery, infrastructure, and governance. Third, it provides practical

evidence for heritage-destination management by identifying the experiential qualities that remain associated with satisfaction during an environmentally disrupted tourism period. Given that the survey-period coefficient is only marginally significant, the contribution is interpreted as contextual rather than as evidence of a strong direct cyclone effect on satisfaction.

2. Literature and theoretical framework

Tourist satisfaction is influenced not only by the objective quality of tourism services but also by how visitors cognitively and emotionally evaluate their travel experience. These evaluations become particularly important when tourism destinations experience external disruption such as climate-related hazards, where visitors reassess destination qualities, safety, authenticity and overall travel experiences. Understanding these behavioural processes is therefore essential for explaining tourist satisfaction in heritage destinations exposed to climate related risk.

The present study primarily integrates heritage-tourism experience research with a disaster-risk-reduction perspective. EDT provides supplementary conceptual support for interpreting satisfaction as an evaluative judgement, but it is not formally tested in the empirical design.

2.1. Heritage Tourism under climate risk

Heritage-tourism differs from many other forms of tourism because its value is derived from both tangible and intangible destination attributes. Tangible attributes include monuments, archaeological remains, historic buildings, transport access, visitor facilities and the physical preservation of heritage resources. Intangible attributes include cultural identity, symbolic meaning, emotional attachment and spiritual value, authenticity and visitor personal engagement with destinations (Domínguez-Quintero et al., 2020; Gao et al., 2020; Zhang et al., 2021). These dimensions make heritage-tourism experiences particularly sensitive to disruption because tourist satisfaction depends not only on whether the destination remains physically accessible but also on whether visitors continue to perceive the experience as authentic, meaningful, safe, and culturally valuable.

Cyclone-related disruptions may affect these dimensions through several mechanisms. Damage to roads, public transport, tourism facilities and surrounding infrastructure may reduce accessibility and service quality. Visible damage, interrupted interpretation services, media coverage, and uncertainty about destination conditions may alter perceived safety and destination image. At the same time, changes to the physical environment and atmosphere of heritage sites may influence tourists' perceptions of authenticity, emotional engagement, and experiential value (Li, 2024; Liu-Lastres et al., 2020; Rosselló et al., 2020). Heritage destinations may therefore remain culturally significant while receiving lower evaluations of accessibility, perceived safety, destination image, and overall satisfaction.

This distinction provides a theoretical basis for examining authenticity, destination image, and situational involvement under contrasting pre-and post-cyclone conditions. Rather than treating cyclone exposure as equivalent to the heritage-experience factors, the study conceptualises it as an external environmental context within which tourist evaluate the cultural, symbolic, and experiential qualities of heritage destinations.

2.2. Tourist satisfaction and the expectation-disconfirmation perspective

Expectation-Disconfirmation Theory explains satisfaction as an evaluative judgement arising from comparisons between prior expectations and experienced performance (Oliver, 1980). This perspective has been widely applied in tourism research, including destination and heritage contexts, to explain how visitors form satisfaction judgements (Aziz et al., 2011; Huh and Uysal, 2004; Pizam and Milman, 1993). These studies demonstrate the relevance of expectation-performance comparisons to tourism satisfaction while also showing that heritage experiences are evaluated through destination attributes, authenticity, service quality, and experiential value.

The present study, however, does not constitute a formal empirical test of EDT because expectations and subsequent experiences were not measured within the same respondents. Instead, the expectation-disconfirmation perspective is used only as supplementary conceptual support for understanding satisfaction as an evaluation of the experienced destination. The principal conceptual framing of the study therefore derives from heritage-tourism experience research and the disaster-risk-reduction perspective, while EDT helps explain the general process through which tourists assess destination experiences relative to prior beliefs and expectations.

2.3. Disaster risk reduction and Behavioural response

Disaster risk reduction conceptualises disaster outcome as the interaction of hazard exposure, vulnerability and adaptive capacity rather than as a direct consequence of a physical hazard alone. Within tourism systems, the relevant form of vulnerability includes infrastructure dependencies, transport accessibility, destination image sensitivity, uncertainty and visitor confidence (Liu-Lastres et al., 2020; Rosselló et al., 2020). Behavioural responses are relevant because tourist assessment of safety, accessibility, service quality and destination attractiveness can influence satisfaction and further destination decisions.

In heritage-tourism, these behavioural considerations interact with the need to protect cultural authenticity, symbolic meaning and experiential value. Disaster risk reduction therefore provides a contextual perspective for understanding why physical recovery alone may be insufficient. Recovery planning must also consider how visitors evaluate destination conditions and whether heritage experiences remain meaningful, accessible and trustworthy.

This behavioural perspective complements traditional tourism-recovery studies that have predominantly examined macro-level outcomes, such as tourist arrivals, economic loses, and destination recovery by forcing instead on individual tourist perception and satisfaction.

2.4. Heritage-Tourism experience factors and tourist satisfaction

Heritage-tourism experiences are multi-dimensional and extend beyond the physical characteristics of destinations. Visitors evaluate heritage destinations through both tangible attributes such as the preservation of historical resources and infrastructure quality and intangible attributes including emotional attachment, cultural meaning and personal involvement (Domínguez-Quintero et al., 2020; Gao et al., 2020; Zhang et al., 2021). From the perspective of EDT, tourists form satisfaction by evaluating whether their actual experience corresponds with their expectations regarding these experiential dimensions (Oliver, 1980). Climate-related hazard events, however, may alter these evaluations by influencing perceptions of destination safety, accessibility, authenticity and overall travel quality. Consequently, the effects of heritage-tourism experience factors should be considered within the broader behavioural context created by cyclone exposure.

Taken together, these mechanisms suggest that cyclone-related disruptions may influence tourist satisfaction indirectly, by changing the environmental context within which heritage authenticity, destination image, and visitor involvement are evaluated. The framework therefore recognises both the distinctive experiential characteristics of heritage-tourism and the external conditions that may shape visitors' assessment of those characteristics.

2.4.1. Objective authenticity

Objective authenticity refers to the genuineness and historical integrity of heritage resources, including monuments, archaeological remains, historical buildings, and cultural artefacts (Lee et al., 2016; Wang, 1999; Zhang et al., 2018; Zhang et al., 2021). Authentic heritage resources enable tourists to experience the destination's historical and cultural significance, thereby increasing the perceived value of their visit (Domínguez-Quintero et al., 2020; Riptiono and Rhamdhani, 2026). Previous studies have consistently demonstrated that visitors who perceive heritage sites as historically authentic report higher satisfaction and stronger emotional attachment to destinations (Lee et al., 2016; Park et al., 2019; Zhang et al., 2021).

Within the context of climate-related hazards, tourists may reassess the authenticity of heritage destinations if cyclone events damage historical structures, restrict access to cultural attractions, or alter the physical environment. Although the historical value of heritage assets remains unchanged, visitors' evaluations of authenticity may be influenced by their perceptions of site preservation and destination conditions following the disruptive events. Accordingly, objective authenticity is expected to remain an important determinant of tourist satisfaction under both normal and post-cyclone conditions.

H_1: Objective authenticity positively influences tourist satisfaction.

2.4.2. Existential authenticity

Existential authenticity represents tourists' personal, emotional, and self-reflective experiences during their interaction with heritage destinations (Wang, 1999). Unlike objective authenticity, which focuses on heritage objects themselves, existential authenticity concerns visitors' feelings of personal fulfilment, emotional engagement, freedom, and connections with the destinations (Domínguez-Quintero et al., 2020; Lee et al., 2016; Zhang et al., 2021). Such experiences often contribute to memorable tourism encounters and enhance satisfaction.

Previous studies have shown that emotionally meaningful tourism experiences enhance satisfaction by allowing visitors to establish deeper psychological connections with the heritage environment (Riptiono and Rhamdhani, 2026; Zhang et al., 2021). However, external disruptions such as cyclone events may influence tourists' emotional engagement by increasing uncertainty, altering travel experiences, or changing the overall atmosphere of heritage destinations. Consequently, visitors' emotional evaluations may become particularly important when assessing satisfaction following cyclone-related disturbances.

H_2: Existential authenticity positively influences tourist satisfaction.

2.4.3. Constructive authenticity

Constructive authenticity refers to tourists' subjective interpretation of cultural authenticity based on their beliefs, expectations, previous experience, and social interaction (Lee et al., 2016; Wang, 1999; Zhang et al., 2018). Rather than being inherent within heritage, constructive authenticity is socially constructed through visitors' interpretations of cultural meaning and heritage experiences.

Previous research suggested tourists who perceive cultural presentations, heritage interpretation, and destination management as credible and meaningful are generally more satisfied with their travel experiences (Domínguez-Quintero et al., 2020; Riptiono and Rhamdhani, 2026; Zhang et al., 2021). Following a cyclone, however, tourists may reinterpret heritage experiences through the lens of destination recovery, maintenance, and visible restoration effects. Consequently, constructive authenticity reflects not only cultural interpretation but also visitors' subjective perception of the destination's continuing heritage identity despite environmental disruptions.

H_3: Constructive authenticity positively influences tourist satisfaction.

2.4.4. Destination image

Destination image represents tourists' overall perceptions of a destination based on cognitive and affective evaluations, including

infrastructure quality, cultural attractiveness, environmental conditions, accessibility, and perceived safety (Chi and Qu, 2008; Chia et al., 2021; Huete Alcocer and López Ruiz, 2019; Jebbouri et al., 2022; Ramkissoon and Uysal, 2011; Uslu et al., 2024). It plays a fundamental role in shaping tourist expectation, destination choice, travel experience and post-visit satisfaction.

Extensive tourism literature identifies destination image as one of the strongest predictors of tourist satisfaction and behavioural intention (Chia et al., 2021; Uslu et al., 2024; Zhao et al., 2024). In disaster-affected destinations, however, destination image becomes particularly sensitive to perceptions of safety, infrastructure recovery, accessibility and media coverage (Lian et al., 2022; Liu-Lastres et al., 2020; Rosselló et al., 2020). Visitors may therefore reassess destination image following cyclone exposure even when cultural attractions themselves remain largely unaffected. From a behavioural perspective destination image represents one of the principal mechanisms through which external hazard events may influence tourist satisfaction.

H_4: Destination image positively influences tourist satisfaction.

2.4.5. Situational involvement

Situational involvement refers to the degree of cognitive and emotional engagement that tourists experience during a specific travel activity or destination visit (Cevdet Altunel and Erkurt, 2015; Lu et al., 2015; Xu et al., 2022; Yang et al., 2022; Zhao et al., 2024). Highly involved tourists actively participate in the destination experience, devote greater attention to cultural interpretation, and derive stronger emotional value from their visits. Previous studies consistently report that greater involvement enhances tourism experiences, strengthens emotional attachment, and improves visitor satisfaction (Cevdet Altunel and Erkurt, 2015; Chang et al., 2011; Perera et al., 2015; Xu et al., 2022; Zhao et al., 2024). Under climate-related hazard conditions, tourist involvement may also influence how visitors interpret destination disruptions. Visitors with higher involvement may focus more strongly on cultural experiences dispute temporary inconveniences, whereas less-involved tourist may be more sensitive to perceived risk and uncertainty.

H_5: Situational involvement positively influences tourist satisfaction.

2.5. Pre- and post-cyclone environmental context

The pre- and post-cyclone periods are treated as contrasting environmental contexts because the study surveyed different individuals during the two periods. The survey-period indicator does not represent a within-person measure or cyclone exposure. Instead, identifies whether average satisfaction differed between respondent surveyed before and after the cyclone while controlling for the selected heritage-tourism experience factors.

The continual comparison complements the heritage-tourism framework by recognising that visitors evaluate authenticity, destination image, involvement and satisfaction within changing destination conditions. However, the study does not formally test whether the cyclone moderates the individual relationship between each heritage-tourism factor and satisfaction. Accordingly, the hypothesis examines whether tourist satisfaction differs between the two survey periods.

H_6: Tourist satisfaction differs between the pre-cyclone and post-cyclone survey periods.

2.6. Conceptual framework and hypothesis development

The conceptual framework integrates three components of heritage: heritage-tourism experience factors, tourist satisfaction and contrasting pre- and post-cyclone environmental context. Objective authenticity, existential authenticity, constructive authenticity,

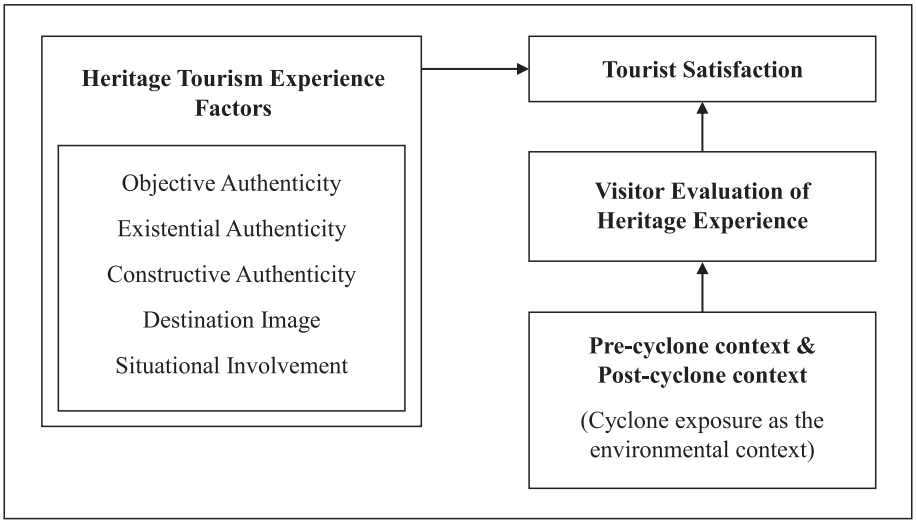


Fig. 1. Conceptual model of heritage-tourism experience factors influencing tourist satisfaction. (Source: Authors' compilation based on the literature.)

destination image and situational involvement are treated as principal factors associated with tourist satisfaction. The survey period indicated captures contextual differences between the two independent samples and is not modelled as a moderator. Fig. 1 presents the conceptual framework developed for the study.

According to EDT, tourists evaluate destinations by comparing their actual experiences with their prior expectations (Oliver, 1980). These evaluations are reflected in overall tourist satisfaction and are influenced by several experiential dimensions of heritage-tourism. In the present study, Objective Authenticity, Existential Authenticity, Constructive Authenticity, Destination Image and Situational involvement represent the principal behavioural factors through which tourist assess their heritage-tourism experiences. Collectively, these constructs explain how tourists interpret both tangible and intangible characteristics of cultural heritage destinations.

Within this framework, Cyclone *Ditwah* represents climate-related hazards that altered the environmental context in which tourists experience Sri Lankan heritage destinations. Although a cyclone is not assumed to directly determine satisfaction, in essence it may influence how tourists perceive destination conditions, accessibility, authenticity, destination image and their overall travel experiences. Consequently, tourist surveyed before and after the cyclone provided an opportunity to examine whether these behavioural evaluations differ under contrasting environmental conditions.

From a disaster risk reduction perspective, behavioural responses constitute an important component of destination resilience because tourist perceptions of safety, destination quality and travel experiences influence destination recovery, revisit intention and long-term tourism sustainability. The conceptual framework therefore assistance tourist satisfaction as the outcome of multiple heritage-tourism experience factors while recognising that climate-related hazards may alter visitor evaluation of these factors.



Fig. 2. Geographic distribution of the selected heritage-tourism destinations Source: Adopted from Site Map (2025).

3. Methodology

3.1. Study context

This study was conducted in three UNESCO World Heritage destinations in Sri Lanka: Sigiriya, Dambulla and Kandy. These destinations represent the country's most prominent cultural heritage attractions and consistently receive the highest number of international visitors (SLTDA, 2025). Beyond their historical and archaeological significance, these cities contribute substantially to Sri Lanka's tourism economy; therefore, particularly important for understanding tourist behavioural responses to climate-related hazards.

Sigiriya, commonly known as the 'Lion Rock Fortress', is recognised for its archaeological significance, ancient urban planning and unique cultural landscape. Dambulla is internationally recognised for its well-perceived cave temple complex, while Kandy is the hometown of the temple of the sacred tooth relic and represents one of Sri Lanka's most important religious and cultural centres. Collectively, these destinations provide diverse heritage-tourism experiences while representing the country's principal tourism corridor. Fig. 2 shows the geographic distribution of the three selected heritage-tourism destinations in Sri Lanka.

The study was undertaken during the period in which Sri Lanka experienced cyclone *Ditwah*, which made landfall on the eastern coast during the 2025 peak tourism season. The cyclone disrupted transport networks, accessibility, tourism operations and visitor mobility across several regions, including the cultural triangle and central highlands (Amaratunga and Kodituwakku, 2026; Fusion Media Limited, 2025; Star Media Group Berhad, 2025). Although the selected heritage destinations remain operational, the cyclone altered the broader tourism environment by influencing accessibility, infrastructure conditions, perceived safety and visitors' overall travel experiences. Consequently, the event provided a unique natural setting to examine how tourists evaluate heritage destinations under contrasting environmental conditions.

From a disaster risk reduction perspective, these destinations represent tourism systems exposed to external climate hazards where destination resilience depends not only on physical infrastructure but also on tourists' behavioural responses, preserving safety and confidence in destination recovery. Examining tourist evaluations before and after the cyclone therefore provides an opportunity to understand how cyclone exposure variables influence behavioural dimensions of tourism resilience, complementing previous studies that have predominantly focused on macroeconomic tourism indicators.

3.2. Research design

This study employed two independent cross-sectional surveys rather than a longitudinal or repeated-measures design. The respondents surveyed after the cyclone were not the same individuals surveyed before the cyclone. Consequently, the study did not measure within-person expectation-experience confirmation and does not claim to provide a formal test of the full EDT process. EDT was instead applied as an interpretative behavioural lens to understanding the satisfaction judgement under contrasting environmental contexts.

The study employed two independent cross-sectional surveys rather than a longitudinal or repeated measures design. The respondents surveyed after the cyclone were not the same individuals surveyed before the cyclone. Consequently, the study did not measure within-person expectation-experience disconfirmation and does not claim to provide a formal text of the full EDT process. Instant EDT was applied as an interpretative behavioural lens for understanding satisfaction judgements under contrasting environmental contexts.

The unit of analysis comprises individual international tourists visiting Sigiriya, Dambulla & Kandy. International tourists were selected because they constitute the principal market segment of Sri Lanka's heritage-tourism industry and are generally more sensitive to perceptions of destination safety, accessibility & service quality following climate-related hazards. Data were collated at the exit points of each heritage destination after visitors had completed their visits ensuring that respondents were able to unite their tourism experience based on the actual destination encounters rather than expectations alone. This approach enhanced the validity of the satisfaction measures while reducing the likelihood of hypothetical or anticipated responses.

Consistent with the revised conceptual framework, the study examines tourist satisfaction as the dependent variable and objective authenticity, existential authenticity, constructive authenticity, destination image and situational involvement as the principal exploratory variables. Cyclone exposure was operationalised as a contextual variable represented by a binary indicator distinguishing observations corrected before and after Cyclone *Ditwah*. Rather than implying direct causal effects of the cyclone itself, this variable captured differences in the environmental context under which tourists evaluated their heritage experiences. Consequently, the study investigated whether tourist evaluations and satisfaction differed between the two survey periods after controlling for the principal heritage-tourism experience factors.

From a disaster risk reduction perspective, the comparative design enabled the assessment of behavioural responses to climate-related hazards by examining changes in tourist perceptions under contrasting environmental conditions. Although the study does not establish social relationships in the experimental cents comparing two independent samples collected before and after a major climate event provides valuable behavioural evidence regarding how hazard exposure may influence destination evaluations, perceived authenticity, destination image and overall tourist satisfaction. Such evidence contributes to understanding tourism resilience by highlighting the role of behavioural adaptation alongside physical recovery and infrastructure restoration.

Finally, the methodological framework combines descriptive analysis, chi-square test, two-way analysis of variance and multiple linear regression to examine complementary dimensions of tourist behaviour. Descriptive statistics summarize tourist perceptions across two survey periods. Chi-square analysis examines changes in demographic and behavioural associations with destination

choice. Two-way ANOVA investigated interaction effects between demographic characteristics and tourist evaluations, while multiple linear regression estimated the relative contribution of heritage-tourism experience factors to satisfaction after controlling for cyclone context. The use of multiple analytical techniques enables a comprehensive assessment of behavioural responses to climate-related hazards while providing robust evidence for the proposed conceptual framework.

3.3. Population, sample strategy and sample size determination

The tested population comprised all international tourists visiting the three selected UNESCO World Heritage destinations in Sri Lanka, Sigiriya, Dambulla, and Kandy during the study. The targeted population comprise international tourists visiting the selected UNESCO World Heritage destinations of Sigiriya, Dambulla and Kandy during the study period. Given the large target population, the minimal required sample size was estimated using Cochran's (1977) formula for a large population.

$$n_0 = \frac{z^2 p(1-p)}{e^2} \tag{1}$$

where,

n_0 represent the minimum required sample size, z is the standard normal deviation according to the confidence level, p is the estimated proportion of an attribute present in the population and e is the acceptable margin of error. A 90% confidence level ($z = 1.645$), a 10% margin of error ($e = 0.10$), and maximum population variability ($p = 0.50$) were applied. Accordingly, the minimum required sample size was approximately ($n = 68$). However, 346 valued respondents were collected, comprising 173 observations from each survey period, to improve statistical precision, maintain balance between pre- and post-cyclone samples and support the comparative and multivariate analysis.

The study employed a multi-stage cluster sampling approach. In the first stage, the three UNESCO World Heritage destinations were selected as geographical clusters because they represent Sri Lanka's principal cultural tourism corridor and account for a substantial proportion of international heritage-tourism. In the second stage, international tourists were approached using systematic intercept sampling at the exit point in each destination after completing their visit. Collecting responses at the conclusion of the visit ensured that participant and experienced the destination sufficiently to evaluate their density, destination image, involvement, and overall satisfaction.

The researchers adopted a comparative cross-sectional sampling design consisting of two independent survey waves. The first survey was conducted before Cyclone *Ditwah*, whereas the second survey was undertaken following the cyclone. Importantly, the respondents participating in the second survey were not the same individuals who participated in the first survey. Rather than tracking identical tourists over time, the study compared two independent samples of visitors exposed to different environmental conditions. This design was considered appropriate because the objective was to examine whether tourist evaluations differ between normal tourism conditions and the post-cyclone context.

To maintain comparability between the two survey periods, identical sampling procedures were implemented across all three destinations. An equal number of responses were targeted before and after the cyclone (173 surveys per period). Thereby minimizing potential sampling bias associated with unequal group sizes. Within each survey period, questionnaires were distributed proportionately across the three locations, resulting in comparable representation of tourists visiting Sigiriya, Dambulla, and Kandy.

Although probability sampling of all international tourists was operationally impractical due to the absence of the complete sample frame and the dynamic nature of tourist movements, the combination of geographical cluster, systematic intercept sampling proportional to locations, and two comparable survey waves enhances the representativeness of the sample while remaining appropriate for real-based tourism research.

3.4. Questionnaire development and measurement

Data were collected using structural self-administrated questionnaire developed from previously validated measurement scales widely used in heritage-tourism and tourist satisfaction research. The questionnaire items were adopted from existing literature to ensure conceptual consistency with the study's theoretical framework while reflecting the specific characteristics of Sri Lankan heritage-tourism destinations. The principal constructs measured included objective authenticity, existential authenticity, constructive authenticity, destination image, situational involvement and tourist satisfaction. Measurement items were adapted from the study, including (Chi and Qu, 2008; Chia et al., 2021; Gao et al., 2020; Wang et al., 2025; Zhao et al., 2024), thereby ensuring content validity and compatibility with previous tourism research.

All latent constructs were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). This scale was selected because it provides an appropriate balance between measurement sensitivity and respondent comprehension while remaining widely adopted in behavioural and tourism research.

The questionnaire was developed in two versions corresponding to two survey periods. The pre-cyclone questionnaire comprised two sections. Section A collected demographic and behavioural information including respondents' gender, age, nationality, purpose of visit, travel mode, visitor type and duration of stay. Section B contained 22 Likert-scale items measuring the six principal constructs examining the conceptual framework together with together with two open-ended questions inviting respondents to provide qualitative comments regarding their heritage-tourism experience.

Following Cyclone *Ditwah*, the questionnaire was revised to incorporate an additional section capturing tourist evaluation of the

post-disaster tourism environment while preserving the original measurement items. Consequently, the post-cyclone questionnaire consisted of three sections. Sections A and B remain unchanged to ensure measurement equivalence of the two survey periods, thereby enabling the comparison between the pre- and post-cyclone responses. The Section C items were analysed separately from the common measurement model because the equivalence cyclone specific questions were not included in the pre-cyclone questionnaire. They were therefore not used as explanatory variables in the principal multiple regression. The common items in sections A and B were used for direct comparison between the two survey periods. While section C provided supplementary evidence relating specifically to the post-cyclone context. Two open-ended questions were designed to capture perceptions of destination recovery, infrastructure conditions, accessibility, perceived safety, confidence in tourism management and future visitor intention following the cyclone. These additional questions were analysed separately and were not incorporated into the principal regression model. Thereby preserving compatibility between the two survey periods. Both pre- and post-cyclone questionnaires are presented in Appendix 1. The questionnaire structure for the two survey periods is presented in Table 1.

Before the main survey, the questionnaire was evaluated through a pilot study involving 50 tourists visiting Kandy, allowing the research team to assess question clarity, wording, completion time and overall instrument validity. Minor revisions were subsequently made to improve wording and sequencing without altering the conceptual meaning of the measurement items. The pilot study also confirmed that respondents were able to complete the questionnaire within an acceptable time while demonstrating satisfaction in internal consistency across the principal construct.

Construct validity was established through the adaptation of previously validated measurement scales reported in the tourism literature, while internal consistency reliability was subsequently assessed using Cronbach's alpha during the statistical analysis. The overall reliability coefficient exceeded the commonly accepted threshold recommended for exploratory behavioural research, indicating satisfactory internal consistency among the measurement items. Further evidence regarding multicollinearity, sensitivity analysis and robustness of the measurement model is presented in Appendix 2.

Finally, because the study compares tourist surveys before and after cyclone *Ditwah*, maintaining measurement equivalence across survey waves is considered essential. Accordingly, all questionnaire items used to measure the principal theoretical contrast remain identical across both survey periods, with only the disaster-specific section C added to the post-cyclone questionnaire. This approach ensures that the observed difference in the tourist evaluation reflects changes in an environmental context rather than differences in measurement instruments.

Potential respondents were approached systematically as they exited each heritage site prior to participation. The purpose of the research was briefly explained, and eligibility was confirmed by ensuring the participants were international tourists aged 18 years or above who had completed their visit. Participation was entirely voluntary and respondents were informed that they could decline or withdraw from the survey at any stage without consequence. No financial or material incentives were offered.

To minimise interviewer bias, all questionnaires were administered using standardised instructions and field researchers received training regarding respondent selection, questionnaire administration and ethical conduct before commencing data collection. The use of consistent survey procedures across destinations and survey periods enhances the reliability and comparability of the collected data. Fig. 3 summarises the research process.

3.5. Ethical considerations

The study was conducted in accordance with internationally accepted principles governing research involving human participants. Ethical considerations were incorporated into the research process to ensure voluntary participation, informed consent, confidentiality, anonymity and responsible data management. Ethical approval for the study was obtained prior to data collection from the SLIIT ethical review board, together with institutional approval from SLIIT Business School. The manuscript should report the official ethical approval reference number issued by the ethical review board, enabling independent verification of the approval process (SLIIT/ERC/SBS/2025/24).

Before completing the questionnaire, each participant received a brief explanation outlining the objective of the study. The voluntariness of participation, the approximate time required to complete the questionnaire and the intended use of research findings. Participants were informed that completion of the questionnaire constitute inform consent and that they were free to discontinue participation at any stage without providing a reason. Only respondents who voluntarily agreed to participate were included in the study.

No personal identification information, including name, contact details, passport number or other identifying characteristics, was collected. Questionnaires were completed anonymously, and all responses were treated as strictly confidential. Data were secured and stored using password-protected electronic files accessible only to the research team and were analysed and aggregated form to

Table 1
Differences between the pre-cyclone and post-cyclone questionnaire.

Component	Pre-cyclone instruments	Post-cyclone instruments	Analytical purpose
Section A	Demographic and travel information	Demographic and travel information	Simple description
Section B	Common heritage experience and satisfaction items	Common heritage experience and satisfaction items	Pre-post comparison and regression
Section C	Not included	Cyclone-specific perception and recovery items	Supplementary post-cyclone analysis

Source: Authors' illustration.

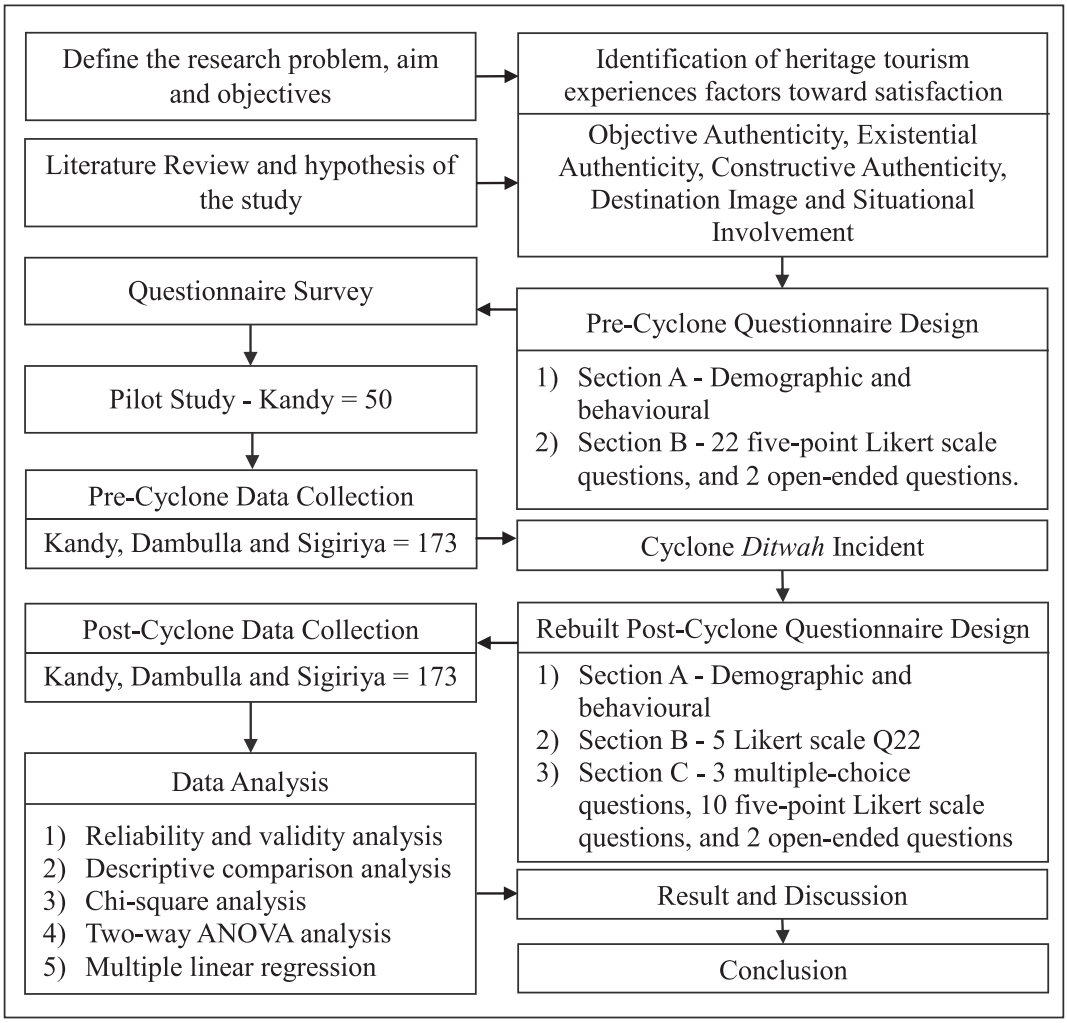


Fig. 3. Methodological framework of the study Source: Based on the authors' compilation.

prevent identification of individual respondents. The study involves minimal risk because it collected only tourist perceptions and evaluations of their heritage-tourism experience without requiring participants to disclose sensitive personal information or undertake any activities beyond completing the questionnaire. Consequently, participation posed no foreseeable ethical, psychological, social or legal risks to respondents.

Finally, the research acquired to recognised principles of research integrity, including honest data collection, transparent statistical reporting, confidentiality of participation information and responsible determination of findings. These procedures ensure that the study was completed with accepted ethical standards and behavioural research involving internal tourists while supporting the credibility and integrity of the reported findings.

3.6. Analysis methods

Three mains statistical analysis techniques were used to analyse the data in STATA.

3.6.1. Chi-square analysis

The chi-square analysis was used to identify associations between the pre- and post-results of the comparison of heritage destinations (column variable) and the demographic and behavioural characteristics (Alteneiji et al., 2024). This analysis was used to identify the specific demographic or behavioural patterns that differed after the cyclone compared to before the cyclone when visiting Dambulla, Sigiriya, and Kandy. Furthermore, Appendix 4 presents changes in tourists' demographic and behavioural characteristics before and after the cyclone to better understand tourist behaviour.

3.6.2. Two-way analysis of variance (ANOVA)

The two-way ANOVA was used to identify significant interaction effects between demographic and behavioural characteristics (independent variables) and the three main dependent variables: pre-cyclone perception, post-cyclone perception, and willingness to revisit (revisit perception). This method was chosen for its reliability and robustness in assessing interaction effects (Piumika et al., 2025). It allows simultaneous testing of differences among groups or categories while controlling for potential confounding factors arising from combined effects.

Before estimating the two-way ANOVA models, the relevant assumptions were assessed. Independence of observations was supported by the research design because each respondent participated only once, and the pre- and post-cyclone surveys comprise independent samples. The approximate normality of residuals was evaluated using residual distribution and q - q plots, while homogeneity of variance was assessed using Levene's test. Potential influential observations and the distribution of populations across interactions were also examined. The diagnostic results indicate that the residuals were approximately normally distributed and confirmed the homogeneity of variance across groups. The completed diagnostic results are reported in Appendices.

For statistical significance, interaction effect post hoc simple effect comparisons based on estimated marginal means were conducted to identify the specific group combinations responsible for the interaction. Pairwise comparisons were adjusted for multiple testing using the Bonferroni and Šídák procedure. Bonferroni adjusted comparison for also examine as a robust check, and the produce substantially Šídák conclusions, although the Bonferroni adjusted was slightly more conservative. The estimated marginal mean differences adjusted *p*-values, and confidence intervals are reported in Appendices.

3.6.3. Multiple linear regression

The multiple linear regression analysis was used to identify how the main variables affect tourist satisfaction and, specifically, whether the cyclone situation significantly affects it (Rathnaweera and Jayathilaka, 2021).

The regression model used for the study:

Table 2
Comparative descriptive statistics of heritage-tourism experience indicators before and after the cyclone.

Variable indicators		Mean			Standard Deviation	
		Pre	Post	Difference	Pre	Post
Objective Authenticity (OA)						
OA1	Historical accuracy of the site	3.90	3.78	−0.12	0.98	0.95
OA2	Genuine performances and heritage sites	4.29	4.20	−0.09	0.80	0.75
Existential Authenticity (EA)						
EA1	Emotional connection to the site	3.51	3.64	0.12	1.01	0.92
EA2	Deep involvement during the visit	3.24	3.98	0.74	1.07	0.91
EA3	Feeling of self-reflection and freedom	3.54	3.73	0.19	1.08	0.99
Constructive Authenticity (CA)						
CA1	Believability of the presentation	4.19	4.10	−0.09	0.78	0.76
CA2	Authenticity shaped by cross-cultural understanding	3.84	3.80	−0.04	0.95	0.94
CA3	Feeling of self-reflection and freedom	4.24	4.32	0.09	0.89	0.80
Destination Image (DI)						
DI1	Infrastructure Factor	3.99	3.89	−0.10	0.82	0.92
DI2	Availability of tourist information	4.00	4.11	0.11	1.18	1.01
DI3	Safe and secure	4.52	4.46	−0.06	0.69	0.77
DI4	Interesting cultural attractions	4.51	4.53	0.02	0.63	0.67
Situational Involvement (SI)						
SI1	Importance and Enjoyment	4.11	4.06	−0.05	0.85	0.81
SI2	Self-expression and Sign	4.51	4.43	−0.08	0.70	0.72
SI3	Risk Probability	3.59	3.87	0.28	1.12	1.09
Tourist Satisfaction (TS)						
TS1	Variety of shows, Rich, and Varied Gastronomy,	4.39	4.35	−0.04	0.77	0.76
TS2	Service Experience	4.02	4.20	0.17	0.83	0.83
TS3	Friendly locals, social environment and Emotional reactions	4.35	4.35	−0.01	0.77	0.80
TS4	Social environment	3.90	3.79	−0.12	1.00	0.99
TS5	Price & Value	4.40	4.38	−0.02	0.68	0.66
TS6	Tourist revitalisation through tourism experience.	3.77	3.80	0.03	0.87	0.88
TS7	more confident about this destination than previous ones	3.51	3.64	0.13	0.88	0.81

Note: Green coloured cells = Increased values, red coloured cells = Decreased values.
Source: Authors' calculation.

$$TS_i = \beta_0 + \beta_1 OA_i + \beta_2 EA_i + \beta_3 CA_i + \beta_4 DI_i + \beta_5 SI_i + \beta_6 Pre_i + \varepsilon_i \quad (1)$$

where for i = n observations:

Tourist satisfaction is the function of three dimensions of authenticity, destination image and situational involvement and is presented in Eq. 1. β_0 is the constant and the coefficients β_1 β_3 represent the impacts from the three authenticity dimensions. The coefficient β_4 β_5 represents the impact of destination image and situational involvement, respectively. The most critical variable in the regression model is $\beta_6 Pre$ the study dummy variable, which is coded as 1 = pre-cyclone condition and 0 = post-cyclone condition. This variable allows identification of whether there is a significant effect of cyclones on tourist satisfaction when all other variables remain constant.

The multiple regression provides the principal test of the proposed relationship between heritage-tourism experience factors, the survey period indicator, and tourist satisfaction. The chi-square and two-way ANOVA analyses are supplementary exploratory procedures. The chi-square analysis describes period-specific association between destination preference and visitor characteristics, while the ANOVA exposes heterogeneity in selected perception and revisit outcomes across demographic and travel-related groups. These supplementary analyses do not constitute a direct test of H_1 to H_6..

4. Results

4.1. Respondent characteristics and descriptive comparison

A total of 346 valid questionnaires were analysed, comparing 173 observations from each survey period. Table 2 provides a descriptive comparison of the heritage-tourism experience indicators. The indicator values generally show positive evaluations in both periods, although individual items show modest increases or decreases. These descriptive differences are presented to summarize the data and should not be interpreted as statistically significant unless supported by the subsequent influences analysis.

Objective authenticity and destination image items showed relatively small descriptive changes between the two periods. The existential authenticity item was generally higher in post-cyclone samples, while situational involvement and satisfaction remained broadly stable. These patterns provide descriptive context only and do not establish that the cyclone was the cause of the observed differences.

Similarly, situational involvement remained relatively stable across the two survey periods despite increasing perceived travel risk after the cyclone. Tourist satisfaction also remained consistently high, with only limited variation across individual indicators. These descriptive findings suggest that although cyclone *Ditwah* has affected certain practical aspects of the tourism experience. The cultural significance and experiential value of the heritage destinations continue to generate positive visitor evaluations. This is statistically significant of those observed differences examined subsequently in Inferential analysis.

4.2. Reliability and diagnostic analysis

Before hypothesis testing, the reliability and suitability of the measurement instrument were evaluated. All constructs achieved Cronbach's alpha values exceeding the recommended threshold of 0.70, confirming satisfactory internal consistency. Furthermore, the multicollinearity diagnostic indicated that all variance inflation factor values were below the accepted threshold of 5.0, while tolerance values exceeded 0.20, suggesting that multicollinearity was not a concern. These results confirm that the measurement instrument was reliable and the explanatory variables appropriate for inclusion in the regression analysis.

4.3. Supplementary Chi-Square analysis

The following chi-square results are reported as supplementary descriptive evidence and are not used to test the study's principal hypothesis.

The chi-square analysis in Table 3 examined whether destination preferences were associated with selected demographic and travel

Table 3
Chi-Square Analysis of tourist demographic and behavioural association with destination preferences before and after cyclone Ditwah.

Variable	Pre χ^2	Post χ^2
Gender	0.0432	0.3736
Age Group	3.2449	16.0039**
Nationality	0.663	8.5912**
Visit Purpose	8.8889**	1.5379
Travel Mode	16.2908**	5.4713
Visitor Type	8.5231**	0.4479
Stay Duration	5.4628	2.0121

Note: Column Variable = Destination Preference (Dambulla, Sigiriya, and Kandy); **Significant at 5% level.
Source: Authors' calculation.

characteristics within each survey period. Significant associations were observed for age and nationality in the post-cyclone sample and for visit purpose, travel mode, and visitor type in the pre-cyclone sample. These results describe period-specific associations between visitor characteristics and destination preferences. They do not demonstrate that the cyclone caused changes in visitor composition or travel behaviour.

The post-cyclone sample contained a higher proportion of first-time visitors and relatively fewer repeat visitors. Because the two survey waves comprised independent cross-sectional samples, this difference should be interpreted only as a period-specific compositional pattern. The available data do not establish whether the difference resulted from the cyclone, accessibility concerns, destination conditions, or other factors affecting visitor composition.

Accordingly, the chi-square findings are treated as supplementary descriptive evidence and are not used to infer cyclone-induced behavioural change.

4.4. Supplementary two-way ANOVA analysis

The two-way ANOVA was conducted as an explanatory supplementary analysis to identify heterogeneity across visitor groups. These interaction tests are not part of the core conceptual model and do not directly test H1 to H6.

As presented in Table 4, a two-way ANOVA was conducted to examine whether demographic and travel-related characteristics jointly influence tourist perceptions before and after cyclone *Ditwah*, as well as their willingness to revisit heritage destinations. The analysis considered interaction effects among gender, age, nationality, travel mode and stay duration.

Before estimating the two-way ANOVA models, the relevant assumptions were assessed; independence of observation was supported by the research design because each respondent participated only once. Approximate risk residual normality was examined using Q-Q plots. The residuals generally follow the reference line, although some departures were observed in the tail, particularly for the post-cyclone perception model. Homogeneity of variance was assessed using Levene's test and was satisfied for most interaction models. However, statistically significant Levene's test results were obtained for the pre-cyclone travel mode*stay duration model ($p = 0.03$) and post-cyclone gender*age ($p = 0.01$), indicating unequal variance in these two cases. According to the results, these specific models were interpreted cautiously, and the complete Levene's test results and Q-Q plots are reported in Appendix 5.

The omnibus ANOVA identified a statistically significant interaction effect for,

- Pre-cyclone perception - Gender and Nationality
- Post-cyclone perception - Age and Nationality, Age and Stay Duration

Table 4
The interaction effect of demographic and behavioural factors on tourist perception.

Dependent Variable	Independent Variables Interactions	F-value	Levene's Statistic
	Gender × Age	0.71	0.73**
	Gender × Nationality	6.14**	0.19**
	Gender × Travel Mode	0.37	2.49**
	Gender × Stay Duration	0.27	2.02**
	Age × Nationality	0.44	0.90**
	Age × Travel Mode	1.98	2.48
	Age × Stay Duration	3.36*	0.65**
	Nationality × Travel Mode	0.19	1.63**
	Nationality × Stay Duration	2.92*	1.89**
Pre-Cyclone Perception	Travel Mode × Stay Duration	0.17	2.94
	Gender × Age	1.08	4.11
	Gender × Nationality	0.15	0.76**
	Gender × Travel Mode	1.14	0.79**
	Gender × Stay Duration	0.09	0.87**
	Age × Nationality	6.35***	1.07**
	Age × Travel Mode	1.71	2.13**
	Age × Stay Duration	3.76**	0.98**
	Nationality × Travel Mode	1.41	0.83**
	Nationality × Stay Duration	0.94	0.82**
Post Cyclone Perception	Travel Mode × Stay Duration	0.00	1.28**
	Gender × Age	1.48	0.35**
	Gender × Nationality	4.42**	0.21**
	Gender × Travel Mode	0.57	1.46**
	Gender × Stay Duration	0.50	0.59**
	Age × Nationality	0.08	0.48**
	Age × Travel Mode	6.24***	0.79**
	Age × Stay Duration	3.84**	1.83**
	Nationality × Travel Mode	1.03	0.75**
	Nationality × Stay Duration	4.85**	0.27**
Willingness to Revisit	Travel Mode × Stay Duration	0.97	1.37**

Note: * Significant at 10%, **Significant at 5% level, ***Significant at 1% level.
Source: Authors' calculation.

- Willingness to Revisit - Gender and Nationality, Age and Travel Mode, Age and Stay Duration, Nationality and Stay Duration

Subsequent post hoc simple effect comparison showed that the statistically significant omnibus interactions were concentrated among selected visitor categories rather than being uniform across all demographic groups. For post cyclone perception, the simple effect age was significant among European visitors, while age related differences were also concentrated among long slay visitors. For willingness to revisit, older self-driving visitors reported higher revisit intention and younger self-driving visitors. Although several comparisons could not be estimated because same interactions cels contain no observation. The Bonferroni adjusted comparison produce same overall patton as the Šídák adjusted result, although the Bonferroni procedure was likely more conservative. Complete estimated marginal means adjusted pairwise comparison confidence intervals and *p*-values are reported in Appendix 6. The willingness to revisit results should be interpreted cautiously because this analysis was conducted on the repeat visitor subsample ($n = 32$), resulting in relatively small numbers within several interaction cells.

For pre-cyclone perceptions, several interaction effects were statistically significant. The interaction between gender and nationality showed the strongest effect, indicating that tourist evaluations differed across nationalities depending on gender. Significant interactions were also observed between age and stay duration and nationality and stay duration, suggesting that perceptions of the heritage experience varied according to both visitors' demographic characteristics and the length of their stay. In contrast, interactions involving travel mode were not statistically significant inclined that the mode of transport had little influence on tourist perception before the cyclone.

The significant interaction effects indicate that perception and revisit-intention patterns were not uniform across all visitor categories in the observed samples. For the post-cyclone sample, some age-related differences varied by nationality and stay duration, while revisit-intention patterns varied across selected combinations of age, gender, nationality, travel mode, and stay duration. These results identify subgroup heterogeneity within the sample but do not establish that the cyclone caused the observed differences. Accordingly, the two-way ANOVA is treated as supplementary exploratory evidence rather than as a test of cyclone-induced behavioural change.

The analysis of willingness to revisit further confirmed the importance of interaction effects. Significant relationships were observed for age and travel mode, gender and nationality, age and stay duration and nationality and stay duration. These results indicate that revisit intentions are influenced by the combined effect of demographic and behavioural characteristics rather than by individual factors alone. Overall, the two-way ANOVA demonstrates that tourists' responses to climate-related disruptions vary across the visitor segments, emphasising the need for targeted recovery strategies that recognise differences in tourist demographic profiles and travel behaviours. Because willingness to revisit could only be evaluated among respondents with prior visitation experience, the interaction analysis for revisit intention was based on the subset of repeat visitors ($n = 32$).

4.5. Multiple linear regression analysis

Multiple linear regression was employed to evaluate the influence of heritage-tourism experience dimensions on tourist satisfaction while controlling for the survey period. As presented in Table 5, the regression model was statistically significant and explained 59.5% of the variation in tourist satisfaction ($R^2 = 0.5930$), indicating that the selected explanatory variables provide substantial explanatory power.

Among the heritage-tourism dimensions, existential authenticity emerged as the strongest predictor of tourist satisfaction ($\beta = 0.268$, $p < 0.01$), demonstrating that emotional attachment, personal engagement, and meaningful cultural experiences play a central role in shaping visitors' overall evaluations. Destination image also exerted a strong positive influence ($\beta = 0.237$, $p < 0.01$), highlighting the importance of favourable perceptions regarding destination attractiveness, safety, infrastructure, and tourism services. These findings indicate that tourists' satisfaction is influenced not only by the authenticity of heritage resources but also by their overall impressions of the destination.

Situational involvement had a positive and statistically significant effect on tourist satisfaction ($\beta = 0.144$, $p < 0.01$), suggesting that visitors who regarded the heritage experience as personally meaningful and enjoyable were more likely to report higher

Table 5
Determinants of tourist satisfaction: Regression estimates.

Variable	Coefficient	Robust Std. Error
Objective Authenticity	0.106***	0.034
Existential Authenticity	0.268***	0.028
Constructive Authenticity	0.060	0.041
Destination Image	0.237***	0.049
Situational Involvement	0.144***	0.044
Pre-Cyclone	0.065*	0.037
Constant	0.789***	0.189
R-Squared	0.5930	
F statistic	85.66***	
Observation	346	

Note: *Significant at 10% level, ***Significant at 1% level.
Source: Authors' calculation.

satisfaction. Likewise, objective authenticity positively influenced tourist satisfaction ($\beta = 0.106$, $p < 0.01$), confirming that the preservation of historical integrity and cultural originality remains an important determinant of visitors' experiences.

In contrast, constructive authenticity did not have a statistically significant effect ($\beta = 0.060$, $p > 0.10$). This finding indicates that tourists' socially constructed interpretations of authenticity were less influential once emotional engagement, destination image, and objective authenticity were simultaneously considered. Accordingly, H_1, H_2, H_4, H_5 were supported, whereas H3 was not supported. The positive and statistically significant coefficient for the pre-cyclone indicator confirms that the tourism satisfaction differed significantly between the two survey periods. Therefore, H_6 is supported.

The pre-cyclone indicator had a Positive coefficient of 0.065 and was statistically significant only at the 10% level. This provides marginal, rather than conventional, evidence that satisfaction was slightly higher in the pre-cyclone sample. The small coefficient and the weak significance level indicate that the period difference should be interpreted cautiously. Accordingly, H_6 received only marginal support.

However, the relatively small magnitude of this coefficient compared with the experiential variables suggests that the difference between the two periods was modest. Authentic cultural experience and positive destination perceptions therefore remain the primary drivers of tourist satisfaction despite the disruption caused by cyclone *Ditwah*.

Overall, the regression results demonstrate that emotional and experiential aspects of heritage-tourism are more influential than externally imposed environmental conditions in determining tourist satisfaction. These findings reinforce the importance of preserving authentic heritage experiences while simultaneously strengthening destination image and visitor engagement as part of post-disaster recovery strategies.

4.6. Qualitative responses according to thematic categories

To complement the quantitative findings, response to the open-ended questions were coded into thematic categories. The frequency of percentage of each of them were calculated separately for the pre- and post-cyclone samples. Table 6 preset these numerical results, while Fig. 4 provides a visual representation on the most frequently recurring terms.

Before the cyclone, the most frequent reported priorities were information 2 (12.90%) and signs 8 (8.60%) followed by Clean 7 (7.53%) and languages, less 6 (6.45%). Following the cyclone the strongest emphasis shifted toward roads 7 (12.96%) and safe 5 (9.26%). This pattern suggests that tourist priorities move from routine visitor service improvements toward recovery related concerns involving accessibility, infrastructure, safety and destination readiness.

Respondents primarily emphasised improvements related to visitor information and tourism facilities. Frequently recurring themes included information, directional signs, cleanliness, toilets, drinking water, and garbage management, indicating that visitors sought better interpretation of heritage attractions and improved basic amenities. These responses suggest that, under normal conditions, tourists primarily evaluate heritage destinations based on service quality and the overall visitor experience.

Following the cyclone, the focus shifted toward infrastructure recovery and visitor safety. The most frequently mentioned themes included roads, infrastructure, repairs, safe, improvements, and transport, reflecting concerns regarding accessibility and destination readiness after the disaster. Respondents also highlighted the importance of timely information, disaster preparedness, and effective recovery measures, emphasising that visible restoration efforts contribute to rebuilding visitor confidence.

Table 6
Frequency of priority improvement themes before and after cyclone Ditwah.

Them	Pre-Cyclone n (%)	Post-Cyclone n (%)
Information	12 (12.90%)	2 (3.70%)
Signs	8 (8.60%)	–
Explanation/Water/Site	5 (5.38%)	–
Languages	6 (6.45%)	–
English/Garbage/Trash/Toilets/Facilities/Food/ Difficulties	3 (3.23%)	–
Clean	7 (7.53%)	–
Safety	1 (1.08%)	3 (5.56%)
Streets/Sidewalks/Stairs/Communication	2 (2.15%)	–
Roads/Crowded	1 (1.08%)	–
Infrastructure	3 (3.23%)	4 (7.41%)
Ticket	4 (4.30%)	–
Less	6 (6.45%)	–
Roads	–	7 (12.96%)
Repair/Rebuilding/Disaster	–	2 (3.70%)
Restoring/Maintenance/Reinforcing/Railway/ Traffic/*Ditwah*	–	1 (1.85%)
Safe	–	5 (9.26%)
Train/People/Media	–	3 (5.56%)
Cyclone/Nothing/Improvements	–	4 (7.41%)
Total	**93**	**54**

Note: The "-" sign indicates unavailable data.
Source: Authors' calculation.

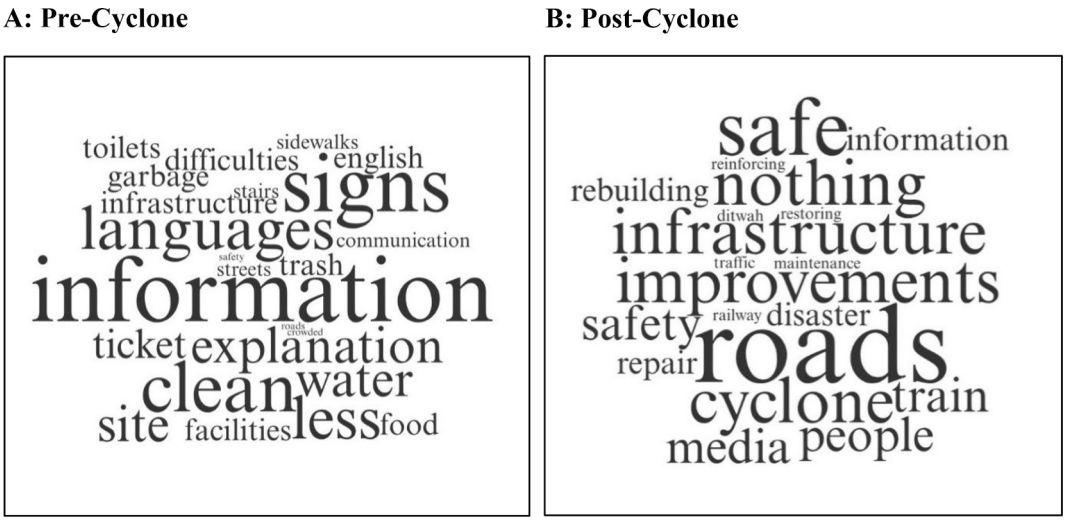


Fig. 4. Tourists perceived that the priority for improvement is in heritage sites before and after the cyclone Source: Generated by www.wordcloud.com.

Overall, the qualitative findings support the quantitative results by demonstrating that tourists continued to value the authenticity and cultural significance of Sri Lanka's heritage destinations despite the cyclone. However, post-disaster expectations increasingly centred on infrastructure resilience, safety, and effective destination management. These findings reinforce the importance of integrating disaster risk reduction measures with heritage-tourism planning to enhance destination resilience and sustain visitor satisfaction under changing climatic conditions.

4.7. Hypothesis summary

The regression results supported H_1, H_2, H_4 and H_5. However, H_3 was not supported because constructive authenticity was not statistically significant. H_6 received marginal support because the survey period coefficient was statistically significant only at the 10% level and at a relatively small magnitude.

4.8. Sensitivity analysis

In addition to the main regression analysis, a sensitivity analysis was conducted to assess the model's robustness and reliability. Sensitivity analysis was conducted by omitting the 10 most extreme high and low responses, after which the regression analysis was rerun. As presented in Appendix 3, the results of the sensitivity analysis are consistent with the original model, which indicates that the model is robust, that the results are not significantly affected by extreme values, and hence the reliability of the dataset.

5. Discussion

The findings indicate that tourist satisfaction at Sri Lankan heritage destinations remained primarily associated with experiential dimensions of the heritage visit rather than with the survey-period indicator. Existential authenticity emerged as the strongest predictor, followed by destination image, situational involvement, and objective authenticity. These findings are consistent with heritage-tourism research showing that satisfaction is closely associated with authenticity, emotional engagement, destination image, and the quality of the visitor experience. The present study extends this evidence by examining these relationships during a period in which destination conditions were affected by cyclone-related disruption.

Importantly, the pre-cyclone survey-period coefficient was statistically significant only at the 10% level and was small relative to the heritage-experience coefficients. This result therefore provides only marginal evidence of a difference in satisfaction between the two survey periods and should not be interpreted as demonstrating a direct cyclone effect. Rather, the relatively stable level of satisfaction across the two independent samples suggests that the cultural, symbolic, and experiential qualities of the heritage destinations remained salient to visitors despite environmental disruption.

From a disaster risk reduction perspective, tourism resilience depends not only on physical reconstruction but also on the capacity of destination systems to maintain visitor confidence, accessibility, safety, and experience quality. Recent research emphasises the integration of disaster risk reduction into sustainable tourism planning, together with institutional preparedness, stakeholder coordination, risk assessment, and collaborative governance (Amri et al., 2025; Filimonau and De Coteau, 2020; Jayasinghe et al., 2024). The present findings therefore suggest that heritage recovery strategies should protect both tangible infrastructure and the intangible experiential qualities that contribute to tourist satisfaction.

The supplementary chi-square and two-way ANOVA findings should be interpreted more cautiously. They indicate that destination preferences and some perception or revisit-intention patterns differed across visitor categories within the observed samples. Because the two survey waves consisted of different individuals, these subgroup patterns cannot establish that the cyclone caused changes in visitor composition or behaviour. Their value lies in identifying heterogeneity that may be relevant for destination communication and visitor management rather than in demonstrating causal effects.

The theoretical contribution of this study does not lie in establishing authenticity, destination image, or situational involvement as new determinants of tourist satisfaction, because these relationships are already well documented in heritage-tourism research. Rather, the study examines whether these established experiential dimensions remain relevant when tourists evaluate heritage destinations under contrasting pre- and post-cyclone conditions. In doing so, it connects heritage-tourism satisfaction research with disaster-risk-reduction concerns by providing micro-level evidence on visitor evaluations during a period of environmental disruption. The marginal survey-period effect further indicates that the contribution should be interpreted primarily as contextual rather than as evidence of a strong direct cyclone effect on satisfaction.

The findings provide practical guidance for destination managers, heritage authorities and policy makers responsible for tourism-recovery. Post-disaster recovery should extend beyond the restoration of damaged infrastructure to include effective risk communication, visitor information systems, accessibility, visible safety measures, preservation of heritage authenticity and destination image management. Recent research indicates that the success of post-disaster reconstruction depends strongly on institutional coordination, stakeholder integration, governance capacity and timely resource mobilisation (Puri et al., 2024). Similarly, disaster risk management and world heritage sites require preparedness measures that account for multiple hazards, site vulnerability and the protection of both tangible and intangible heritage values (Li, 2024).

6. Conclusions

This study examined tourist satisfaction at three Sri Lankan heritage destinations using two independent samples surveyed before and after Cyclone Ditwah. Existential authenticity emerged as the strongest predictor of satisfaction, followed by destination image, situational involvement, and objective authenticity, while constructive authenticity was not statistically significant. The pre-cyclone survey-period coefficient was positive but significant only at the 10% level, providing limited evidence that satisfaction differed between the two survey periods.

The contribution of the study lies not in identifying new determinants of tourist satisfaction, but in examining the continued relevance of established heritage-tourism experience factors within an environmentally disrupted destination context. The results also provide micro-level visitor evidence that complements broader disaster-risk-reduction and tourism-resilience research.

For destination managers, the findings highlight the importance of maintaining authenticity, destination image, visitor information, accessibility, and safety during recovery. Heritage-destination resilience therefore requires attention to both the physical recovery of tourism infrastructure and the experiential qualities that sustain visitor satisfaction.

The findings should be interpreted in light of the use of two independent cross-sectional samples and the focus on three Sri Lankan heritage destinations. Future research could employ longitudinal designs, broader destination samples, and direct measures of risk perception, destination trust, preparedness, and resilience to examine how visitor evaluations evolve across different stages of disaster recovery.

CRediT authorship contribution statement

Sithma Gamage: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Formal analysis, Data curation, Conceptualization. **Nethmi Silva:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Formal analysis, Data curation. **Dahami Silva:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Formal analysis, Data curation. **Oshini Jayarathna:** Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Data curation. **Ruwan Jayathilaka:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Oshani Vidarshika:** Writing – review & editing, Writing – original draft, Investigation.

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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.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.crm.2026.100897.

Data availability

Data will be made available on request.

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