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-RESEARCH ARTICLE-

GREEN INNOVATION TOWARD A SUSTAINABLE GREEN HUMAN-MADE TOURISM DESTINATION: THE MODERATING ROLES OF GREEN COMMITMENT AND GREEN ATTRACTIVENESS

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─Abstract─

This research investigates how four forms of green innovation, namely green product, green process, green technological, and green organisational innovation, influence the sustainability of human-made green tourism destinations, with particular attention to the moderating effects of green commitment and green attractiveness. A causal survey approach was adopted, focusing on destination management organisations responsible for human-made tourism attractions across Jakarta, Batu, Bandung, Bogor, and Surabaya. Data collected from owners and operational managers through proportional purposive sampling were examined using Partial Least Squares Structural Equation Modelling (PLS-SEM). The results demonstrate that both green product innovation and green process innovation contribute positively and significantly to destination green

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Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

sustainability. In contrast, green technological innovation has a significant adverse effect, whereas green organisational innovation does not demonstrate a statistically significant influence. Green commitment strengthens the relationships involving green product innovation and green organisational innovation. Green attractiveness, meanwhile, enhances the positive relationship between technological innovation and sustainability but reduces the strength of several other relationships. These findings extend sustainability theory to human-made tourism environments and provide practical implications for managers seeking to develop more environmentally sustainable tourism destinations in Indonesia.

Keywords: Green Innovation, Sustainable Green Human-Made Tourism Destination, Green Commitment, Green Attractiveness

INTRODUCTION

Tourism has become an important component of modern economic and social development, contributing to national economies in both developed and developing countries through foreign-exchange generation, employment opportunities, spatial redistribution of economic benefits, and the productive use of natural and cultural resources (Dwyer, 2022; Schubert et al., 2011). Accordingly, the role of governments extends beyond the implementation of tourism policies and programmes to creating an enabling environment in which destination management organizations (DMOs) can improve destination attractiveness, service standards, and sustained competitiveness (Akadiri et al., 2019). This involves establishing responsive regulatory arrangements, encouraging coordination across sectors, and promoting collaborative governance involving investors, tourism operators, and local communities. The effectiveness of these institutional arrangements is increasingly important in determining whether tourism growth can be pursued without exceeding environmental and social limits.

Tourism destinations around the world compete through the strategic utilisation of landscapes, cultural heritage, culinary resources, and deliberately constructed attractions. For many years, nature-based pleasure tourism has strongly influenced travel preferences, with visitors seeking relaxation, aesthetic experiences, and meaningful encounters with natural scenery (Afshardoost & Eshaghi, 2020; Viglia & Dolnicar, 2020). A similar orientation characterised the earlier development of tourism in Indonesia, where mountains, coastal areas, and conservation sites served as major visitor attractions (Yoety, 2008). The structure of contemporary tourism, however, has become more diverse. Natural resources are increasingly complemented by human-made attractions, including theme parks, waterfront developments, integrated resorts, entertainment precincts, and artificially created ecological environments (Cooper et al., 2008; Hannigan, 1998). In some tourism markets, the expansion of deliberately designed attractions has surpassed that of exclusively nature-based sites (Bryman,

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

2004). This development highlights the growing role of artificial destinations in diversifying tourism products and maintaining visitor demand throughout the year.

Patterns of domestic tourism in Indonesia further demonstrate the considerable potential of this market, while simultaneously revealing pressures associated with concentrated visitor movement. Official statistics report a high number of domestic trips but comparatively limited participation rates, suggesting that considerable demand remains available for further development (Statistik, 2025). Recreation and leisure represent major motivations for domestic travel, with younger members of the working population accounting for a substantial proportion of visitors. Nevertheless, expenditure per trip and duration of stay continue to be influenced by financial and temporal limitations. Collective leave arrangements and national holidays can amplify short-distance travel and increase visitor concentrations within local destinations. Similarly, major events demonstrate the importance of regional and local visitors, who frequently account for a substantial proportion of total attendance. Domestic tourism consequently represents a critical component of destination viability and has direct implications for the operating models of privately managed attractions.

Indonesia's tourism development framework, particularly Law No. 10/2009 and the national tourism master plan, promotes the development of destinations based on local potential while maintaining a commitment to sustainability. The designation of super-priority and priority destinations has consequently increased policy attention towards selected natural and cultural resources. Alongside these government-led initiatives, private and hybrid tourism actors have increasingly developed human-made attractions, particularly in locations where distinctive natural resources are not equally available. Within this context, Hannigan (1998) concept of the fantasy city provides a useful analytical perspective because contemporary leisure environments are often deliberately constructed around themes, simulations, and spectacles rather than relying exclusively on direct encounters with natural authenticity. When appropriately planned, such destinations can support infrastructure development, employment generation, reduced seasonal dependence, and lower visitor pressure on environmentally fragile natural areas (Cooper et al., 2008).

The expansion of tourism, however, is accompanied by substantial environmental consequences. Tourism activities that depend upon environmental quality can also contribute to its deterioration through pollution, increasing waste volumes, excessive resource consumption, and pressure on vulnerable ecosystems (Pan et al., 2018; Weaver, 2006). This contradiction becomes particularly pronounced in human-made destinations, where the delivery of tourism experiences can require considerable quantities of energy, water, construction materials, and operational resources while accommodating high visitor volumes. Consequently, green sustainability should be understood as more than a descriptive or promotional label. It requires the systematic

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

integration of environmentally responsible practices with social responsibility and economic viability across destination operations (Franceschini et al., 2016). Failure to establish this integration may expose artificial destinations to accusations of greenwashing, escalating operational expenditure, and declining credibility among visitors whose environmental awareness is increasing.

Human-made tourism destinations encounter additional managerial difficulties because their continued viability depends on their ability to attract repeat and new visitors, distinguish their offerings from an expanding number of competitors, and manage substantial operational expenditure. Innovation is therefore a fundamental requirement for maintaining competitiveness. However, innovation pursued without sufficient consideration of environmental implications can increase dependence on natural resources and heighten exposure to regulatory requirements. In contrast, environmental initiatives that are poorly connected to visitor experiences or embedded organisational practices may produce limited improvements in either sustainability or competitive performance. This competing set of requirements creates a need to conceptualise green innovation as a multidimensional managerial approach rather than treating it as a symbolic or isolated environmental initiative.

Within tourism, hospitality, and other sectors, green innovation has increasingly been recognised as an important mechanism for improving sustainability performance (Asadi et al., 2020; Elzek et al., 2021; Xie et al., 2006). Existing scholarship generally distinguishes among green product, green process, green technological, and green organizational innovation, recognising that these dimensions may influence organisational outcomes through different mechanisms (Dong et al., 2014; Gürlek & Tuna, 2018). Other studies have highlighted the importance of environmental commitment among senior management and the green attractiveness of tourism offerings in determining whether innovation efforts generate meaningful sustainability outcomes (El-Kassar & Singh, 2019; Haldorai et al., 2022; Suki, 2016). Despite these contributions, the existing literature provides limited integrated evidence concerning how these mechanisms operate within human-made tourism destinations, particularly in emerging economies.

Four important gaps can therefore be identified in the existing literature. First, research examining green innovation within tourism has largely focused on hotels and travel agencies, whereas privately operated human-made destinations have received considerably less scholarly attention. Second, existing studies frequently conceptualise green innovation as a unified construct, potentially concealing differences in the effects generated by product, process, technological, and organizational innovation. Third, environmental commitment has commonly been investigated as an antecedent or mediating mechanism, while its capacity to alter the strength of several innovation-related relationships remains insufficiently examined. Fourth, research on green

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

attractiveness has predominantly approached the concept through consumer perceptions and behavioural intentions, providing limited understanding of whether it conditions the relationship between managerial innovation and destination sustainability. These limitations are particularly significant in Indonesia, where human-made attractions are developing rapidly alongside increasing demands for environmentally responsible tourism.

Against this backdrop, the present study examines the effects of green product, process, technological, and organizational innovation on the sustainability of green human-made tourism destinations in Indonesia, while assessing whether green commitment and green attractiveness moderate these relationships. The empirical analysis centres on DMO managers and owners located in Jakarta, Batu, Bandung, Bogor, and Surabaya, where substantial concentrations of popular artificial tourism attractions are found. The study contributes to the literature by bringing together four dimensions of green innovation and two moderating mechanisms within the relatively underexplored setting of human-made tourism destinations. In doing so, it extends sustainability theory to artificial tourism environments while generating practical insights for destination managers seeking to strengthen environmental performance and develop greener tourism offerings.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Sustainability Theory as the Underpinning Lens

This study draws upon sustainability theory within the Brundtland tradition, which conceptualises sustainable development as the pursuit of present needs while safeguarding the capacity of future generations to satisfy their own requirements (WCED, 1987). At its core, this perspective requires the simultaneous consideration of environmental protection, social equity, and economic viability. The development of sustainability thought can be traced through successive concerns regarding ecological degradation, the modelling of finite resource systems, and the growing recognition that organisational performance should not be assessed solely through financial outcomes. Within tourism research, sustainability has consequently shifted from being a supplementary environmental consideration to becoming a strategic concern that connects destination competitiveness with ecological protection and community well-being (Pan et al., 2018; Weaver, 2006).

From this theoretical perspective, green sustainability can be understood as a comprehensive condition in which environmentally responsible practices are incorporated into a wider and enduring sustainability system. The concept of green primarily concerns environmental protection and the minimisation of ecological damage, whereas sustainability encompasses the broader interdependence of environmental, social, and economic objectives (Franceschini et al., 2016). This

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

distinction has important analytical implications because the adoption of individual green practices does not necessarily result in overall sustainability. In the context of human-made tourism destinations, therefore, the presence of technologically advanced or resource-efficient solutions alone cannot guarantee sustainable development. Such measures must also contribute to social responsibility and the destination's capacity to remain economically viable over the long term.

Human-made attractions provide a particularly relevant setting for applying sustainability theory because their deliberately engineered nature creates opportunities to incorporate environmentally responsible materials, operational processes, technologies, and organisational practices from the design stage (Cooper et al., 2008; Hannigan, 1998). Compared with purely natural destinations, where intervention may be restricted by ecological vulnerability and conservation requirements, designed attractions generally offer greater flexibility to modify service environments, energy infrastructure, visitor movement, and managerial systems. Such flexibility, however, is accompanied by greater managerial responsibility, since engineered systems can generate both sustainable outcomes and environmental inefficiencies depending on how they are designed and operated. Sustainability theory consequently serves not only as a normative foundation for guiding green innovation but also as a framework for evaluating whether configurations of green practices produce meaningful and enduring improvements in destination sustainability.

Green Innovation in Tourism Destinations

Innovation is consistently identified as an important mechanism for enhancing productivity and maintaining competitiveness within the tourism sector (Elzek et al., 2021). Within this broader innovation domain, green innovation encompasses the creation and adoption of products, operational processes, technologies, and organisational practices intended to lessen environmental impacts while maintaining or enhancing organisational performance (Dong et al., 2014; Xie et al., 2006). In tourism destinations, such innovation can contribute to lower operating expenditure by improving resource utilisation, enhance organisational legitimacy among environmentally aware visitors, and establish distinctive positioning in competitive destination markets. Nevertheless, implementing green innovation is not without challenges, as it demands financial resources, organisational capabilities, and sustained managerial support. Where environmental initiatives are poorly aligned with operational requirements, they may increase costs without producing corresponding improvements in sustainability.

Evidence from the hotel and travel-agency sectors generally indicates a favourable relationship between green innovation and sustainability-related performance, although the strength of these outcomes may depend on the extent of environmental commitment within the organisation (Asadi et al., 2020; Elzek et al., 2021). In particular, process-

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

based green innovation has been associated with improvements in both environmental performance and competitive outcomes (Chiou et al., 2011; Xie et al., 2006). Research also suggests that organisational green culture and identity influence the extent to which environmental concerns are recognised, legitimised, and translated into organisational action (Gürlek & Tuna, 2018; Sanjay Sharma, 1999). Taken together, these findings support conceptualising green innovation through multiple dimensions rather than reducing it to a single aggregated construct. Such an approach is particularly relevant to destination organisations, where visitor offerings, operational systems, technological infrastructure, and managerial processes are closely interconnected.

A multidimensional perspective is particularly applicable to human-made tourism destinations because each form of green innovation operates through a distinct managerial domain. Green product innovation determines the nature of the experiences and offerings made available to visitors, whereas green process innovation concerns the way services are delivered and resources are utilised. Green technological innovation influences the environmental intensity of facilities, including their consumption of energy and water, while green organizational innovation determines whether environmental objectives are embedded within everyday managerial routines and organisational practices. Examining these dimensions independently therefore provides a more detailed basis for identifying the specific innovation mechanisms through which sustainable green human-made tourism destinations can be developed.

Effect of Green Product Innovation on Sustainable Green Human-Made Tourism Destinations

Green product innovation refers to the redesign or development of tourism offerings in ways that improve their environmental performance, such as through the use of environmentally responsible accommodation materials, interactive learning facilities, and community-oriented sustainable tours (Suki, 2016; Xie et al., 2006). Tourism products are not limited to individual services but represent integrated experiential packages combining attractions, amenities, accessibility, and supporting services. Incorporating environmental considerations across these components can decrease material consumption, enhance visitors' environmental awareness, and contribute to the preservation of local cultural resources. Within human-made destinations, this approach may involve using bamboo or recycled materials in accommodation facilities, establishing educational activities that convey conservation principles, and designing community-based tours that involve residents in protecting and maintaining cultural heritage.

Previous research has associated green product strategies with stronger sustainability positioning and greater market attractiveness, particularly within hospitality settings (Asadi et al., 2020; Elzek et al., 2021). By incorporating environmental considerations

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

into the visitor experience, tourism offerings can strengthen destination identity while reducing reliance on consumption practices that generate greater environmental harm. This is particularly relevant for human-made destinations, where operators must contend with substantial operating expenses and strong competitive pressures. Environmentally improved products may therefore provide a dual benefit by enhancing the quality of visitor experiences while contributing to broader destination-level sustainability. On this basis, green product innovation is expected to have a positive influence on the sustainable green human-made tourism destination.

H1: *Green product innovation positively influences the sustainable green human-made tourism destination.*

Effect of Green Process Innovation on Sustainable Green Human-Made Tourism Destinations

Green process innovation involves redesigning operational activities to improve resource efficiency while limiting their adverse environmental effects (Harald Buijtendijk, 2018; Khan et al., 2021). For human-made tourism destinations, this may involve replacing conventional service procedures with digital and resource-efficient alternatives, including online reservation systems, electronic entry and exit management, digital channels for complaints and visitor feedback, and loyalty schemes that minimise reliance on paper-based administration and unnecessary service procedures. Beyond reducing material and administrative waste, these practices can facilitate smoother visitor movement and provide operational information that enables managers to identify opportunities for further improvements in both environmental performance and service delivery.

The environmental benefits of process innovation are accompanied by potential gains in operational efficiency, regulatory compliance, and organisational legitimacy (Chiou et al., 2011; Xie et al., 2006). Its importance is particularly evident in human-made destinations where substantial visitor volumes are accommodated within geographically constrained facilities, making the efficiency of everyday resource use and service flows especially important. Furthermore, process-based improvements can be reproduced over successive operating periods once digital, streamlined, or low-waste procedures become embedded in organisational routines. Their cumulative effects can consequently extend beyond individual operational interventions. Accordingly, greater adoption of green process innovation is expected to contribute positively to destination green sustainability.

H2: *Green process innovation positively influences the sustainable green human-made tourism destination.*

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

Effect of Green Technological Innovation on Sustainable Green Human-Made Tourism Destinations

Green technological innovation encompasses the adoption and application of technologies designed to improve environmental performance, including renewable energy systems, energy-efficient lighting, efficient climate-control infrastructure, and water-conservation technologies (Dong et al., 2014; Harald Buijtendijk, 2018). Technological advancement is commonly regarded as an important means of supporting greener destination development because it can reduce emissions, limit resource consumption, and improve the environmental efficiency of tourism facilities. Technologies such as solar energy systems, high-efficiency cooling equipment, LED lighting, and water-saving installations can, in principle, reduce environmental pressures while maintaining the level of comfort expected by visitors.

However, the environmental contribution of technological innovation is not necessarily automatic. Implementing advanced technologies may require substantial initial expenditure and ongoing maintenance, while also creating demands for specialised technical expertise. Their effectiveness can be further constrained when newly adopted systems are poorly integrated with established operational practices or when organisational capabilities are insufficient to manage them effectively. Additional challenges may arise from temporary operational disruption, reliance on technology suppliers, and the underutilisation of installed equipment. Under such circumstances, technological investments may be viewed by managers as additional operational burdens rather than effective sustainability mechanisms. Thus, although green technological innovation is theoretically expected to improve destination sustainability, its actual contribution may depend substantially on implementation effectiveness, supporting organisational capabilities, and the specific context in which the technology is introduced.

H3: *Green technological innovation positively influences the sustainable green human-made tourism destination.*

Effect of Green Organizational Innovation on Sustainable Green Human-Made Tourism Destinations

Green organizational innovation integrates environmental objectives into the internal management and governance of tourism destinations through mechanisms such as employee training, external communication of environmental initiatives, and systematic monitoring of environmental performance (Gürlek & Tuna, 2018). When environmental responsibility becomes embedded within organizational identity, it is more likely to influence everyday managerial judgement and operational practices rather than being treated as a separate or temporary concern (Sanjay Sharma, 1999). In this respect, organizational greening establishes the cultural and administrative foundations required

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

for continuous environmental improvement by developing common environmental values, reinforcing accountability mechanisms, and communicating sustainability commitments to visitors and other relevant stakeholders.

Nevertheless, the adoption of organizational innovations does not necessarily produce immediate or observable improvements in artificial destinations. Internal initiatives that are largely symbolic, weakly implemented, or inadequately communicated may have limited influence on actual environmental performance. For example, employee training may have little effect in the absence of subsequent supervision, environmental monitoring may become ineffective when findings do not inform managerial action, and sustainability communication may lose credibility when it is not supported by corresponding operational practices. Consequently, green organizational innovation is theoretically expected to contribute positively to destination green sustainability, although its effectiveness may depend on complementary conditions, particularly the strength of managerial commitment to environmental objectives.

H4: *Green organizational innovation positively influences the sustainable green human-made tourism destination.*

The Moderating Role of Green Commitment

Green commitment represents the extent to which senior management recognises the importance of sustainable destinations, incorporates sustainability into strategic priorities, responds to environmentally oriented customer expectations, provides leadership support for green initiatives, and develops employees' capabilities to address sustainability-related challenges (El-Kassar & Singh, 2019; Haldorai et al., 2022). From the perspective of Upper Echelons Theory, managerial values, experiences, and orientations can influence the strategic choices made by organisations (Hambrick, 2007). Accordingly, a strong commitment from senior management can facilitate the translation of green innovation into sustainability outcomes by directing organisational attention towards environmental priorities, mobilising the necessary resources, and providing institutional legitimacy for green initiatives.

Existing evidence indicates that managerial commitment can reinforce the implementation of green practices and contribute to stronger sustainability-related performance (El-Kassar & Singh, 2019; Haldorai et al., 2022). Nevertheless, its moderating influence may vary depending on the type of innovation being implemented. Green product and green organizational innovations are likely to require stronger strategic direction and cultural support, whereas green process and green technological innovations may be influenced more strongly by technical capabilities, investment requirements, cost considerations, and compatibility with existing systems. Despite these potential differences, the present study examines green commitment as a moderator across all four innovation-sustainability relationships and proposes that

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

stronger managerial commitment will reinforce each of these relationships.

H5: *Green commitment strengthens the effect of green product innovation on the sustainable green human-made tourism destination.*
H6: *Green commitment strengthens the effect of green process innovation on the sustainable green human-made tourism destination.*
H7: *Green commitment strengthens the effect of green technological innovation on the sustainable green human-made tourism destination.*
H8: *Green commitment strengthens the effect of green organizational innovation on the sustainable green human-made tourism destination.*

The Moderating Role of Green Attractiveness

Green attractiveness refers to the extent to which a destination's environmental attributes are visible and appealing to visitors, including the use of environmentally responsible construction materials, low-impact local transportation, and organic or locally sourced products that contribute to the livelihoods of nearby producers (Asadi et al., 2020; Suki, 2016). Such visible environmental cues can influence how visitors evaluate destination value and may encourage positive behavioural responses, including recommendations and intentions to revisit. From a destination management perspective, green attractiveness is therefore important because it converts environmental characteristics into recognisable experiential benefits and market value.

The effectiveness of green attractiveness, however, depends on whether environmental claims are supported by substantive operational practices. Credible and observable green features may increase the visibility of technological investments by allowing visitors to directly encounter and appreciate their environmental benefits. In contrast, an emphasis on environmental image without corresponding integration into destination operations may divert attention from underlying product, process, or organizational innovations and potentially weaken their contribution to sustainability. This distinction is particularly relevant for human-made destinations, where substantial investments may be directed towards visually appealing and experience-oriented green branding. Accordingly, this study examines whether green attractiveness strengthens the relationships between each dimension of green innovation and destination sustainability, while recognising that its actual moderating effects may differ across the individual innovation pathways.

H9: *Green attractiveness strengthens the effect of green product innovation on the sustainable green human-made tourism destination.*
H10: *Green attractiveness strengthens the effect of green process innovation on the sustainable green human-made tourism destination.*
H11: *Green attractiveness strengthens the effect of green technological innovation on the sustainable green human-made tourism destination.*

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

H12: *Green attractiveness strengthens the effect of green organizational innovation on the sustainable green human-made tourism destination.*

Building on the preceding hypothesis development, the proposed relationships among the study variables are consolidated in the research framework shown in Figure 1.

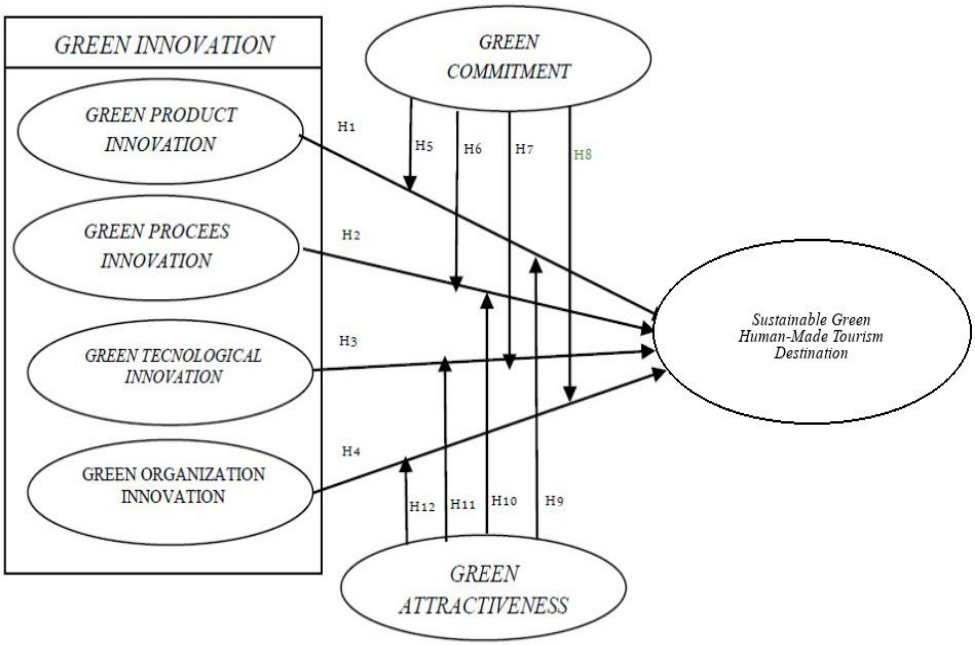

Figure 1: Proposed Research Model

RESEARCH METHOD

Contextual Justification of the Study Setting

The five cities included in the study constitute important and highly active markets for human-made tourism in Indonesia, each characterised by distinctive patterns of attraction development. Jakarta functions as a major centre for metropolitan entertainment and lifestyle-oriented tourism, whereas Batu is recognised for its concentrated cluster of family-oriented recreational attractions. Bandung and Bogor benefit from their accessible highland settings and support a diverse range of themed attractions and resort-based tourism facilities. Surabaya, meanwhile, serves as a major urban leisure centre in eastern Java. Examining green innovation across these varied destination contexts provides broader empirical relevance and strengthens the applicability of the findings to destination managers operating in competitive environments characterised by substantial visitor volumes.

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

Research Design and Analytical Approach

This research employs a quantitative explanatory design to investigate the causal associations between the dimensions of green innovation, the sustainable green human-made tourism destination, and the moderating roles of green commitment and green attractiveness (Sekaran & Bougie, 2016). This methodological approach is consistent with the study's objective of empirically testing theoretically derived hypotheses rather than limiting the investigation to descriptive or exploratory analysis. The research adopts a cross-sectional organisational-level design, whereby managerial respondents act as key informants regarding destination practices and related outcomes. The empirical analysis was conducted using Partial Least Squares Structural Equation Modelling (PLS-SEM) through SmartPLS 4. This analytical technique is appropriate for predictive research involving complex models with several explanatory variables and interaction effects, while also providing flexibility for theory development and theoretical extension in management research (Joseph F. Hair et al., 2022; Joseph Hair, 2014). The analysis proceeded through three principal stages: assessment of the outer model, evaluation of the inner model, and bootstrapping procedures to determine the statistical significance of both direct and moderating relationships.

Population, Sample, and Data Collection

The study population consisted of DMOs responsible for managing human-made tourism destinations across five Indonesian cities characterised by concentrated clusters of artificial attractions. The identified operators comprised 243 in Jakarta, 165 in Batu, 176 in Bandung, 132 in Bogor, and 107 in Surabaya, resulting in a total population of 823 operators based on compiled secondary listings (Databoks, 2023). These locations were selected because of their substantial visitor activity and concentration of human-made attractions, making them appropriate settings for investigating green innovation and sustainability practices within artificial tourism destinations. Sample size determination followed the observation-to-indicator rule, which recommends a minimum of ten observations for each measurement indicator (Joseph Hair, 2014). Given the 28 indicators used in the measurement model, the resulting minimum sample requirement was 280 respondents. Proportional purposive sampling was subsequently employed to distribute the required sample across the five cities, producing 82 respondents from Jakarta, 56 from Batu, 60 from Bandung, 45 from Bogor, and 37 from Surabaya. This distribution maintained proportional representation across the selected locations while satisfying the minimum sample requirement for PLS-SEM analysis.

Respondents were eligible to participate if they were owners, directors, or operational managers, were aged 26 years or above, managed, green-oriented human-made tourism destinations, and possessed sufficient knowledge of green concepts. These requirements were established to ensure that participants occupied decision-relevant positions and had adequate familiarity with the destination's green innovation and sustainability

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

practices. Data were gathered using a structured questionnaire administered through Google Forms. Where necessary, follow-up communication and interviews were conducted to obtain clarification and improve response completeness. Following the screening process, all 280 targeted responses met the completeness and eligibility requirements and were retained for subsequent analysis.

Measurement Instruments

The measurement items were derived from established validated scales and subsequently adapted to reflect the specific context of artificial tourism destinations. Green product innovation was based on Suki (2016) and Xie et al. (2006), with the items addressing the use of environmentally friendly accommodation materials, interactive information facilities, and sustainable tours that provide support to local communities. Green process innovation was operationalized using measures from Khan et al. (2021) and Xie et al. (2006), encompassing online reservation systems, digital entry and exit procedures, online complaint and feedback mechanisms, and loyalty programmes. Measures of green technological innovation were derived from Dong et al. (2014) and Harald Buijtendijk (2018) and focused on renewable energy adoption, energy-efficient systems, and technologies designed to conserve water. Green organizational innovation was measured using items adapted from Gürlek and Tuna (2018), covering employee training related to sustainability, communication of green practices to the public, and the monitoring of environmental performance. The dependent construct, sustainable green human-made tourism destination, captured practices relating to the identification of green alternatives, collection of customer information, encouragement of visitor feedback, assessment of green performance through visitor experiences, communication of green programme information, and reporting on the performance of green programmes. These dimensions reflect the broader principles of sustainability-oriented destination management (Pan et al., 2018; Weaver, 2006).

Green commitment was assessed through indicators addressing top-management understanding of sustainability, strategic emphasis on green objectives, managerial support, responsiveness to environmentally oriented customer requests, backing for sustainability initiatives, and employee training (El-Kassar & Singh, 2019; Haldorai et al., 2022). Green attractiveness was operationalized through measures concerning the use of environmentally friendly construction materials, environmentally responsible local transportation, and the provision of organic or locally sourced products (Asadi et al., 2020; Suki, 2016). All measurement items were evaluated using a five-point Likert scale extending from strongly disagree to strongly agree.

Validity, Reliability, and Model Evaluation

Before the main survey was administered, a pretest involving 30 respondents was conducted to identify and refine issues relating to item wording and clarity. The

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

subsequent PLS-SEM analysis assessed the outer model using indicator loadings, average variance extracted (AVE), and composite reliability. Following the recommended criteria, indicator loadings within the range of 0.60 to 0.70 or above, AVE values exceeding 0.50, and composite reliability values greater than 0.70 were considered indicative of satisfactory convergent validity and construct reliability (Joseph F. Hair et al., 2022). Discriminant validity was examined using cross-loadings together with the relevant assessment criteria. Evaluation of the inner model incorporated path coefficients, bootstrapped t-statistics and p-values, alongside complementary goodness-of-fit measures. To determine whether green commitment and green attractiveness altered the relationships between green innovation dimensions and the dependent construct, interaction terms were incorporated into the structural model. Hypothesis testing was conducted using two-tailed bootstrapping, with statistical significance assessed against the conventional five percent threshold. Participation was voluntary, and respondents were informed that the collected information would be used exclusively for academic purposes. The reporting process also ensured that no personally identifiable information or commercially sensitive organisational secrets were disclosed.

RESULTS

Respondents' Characteristics

Table 1 presents the demographic and professional characteristics of the 280 respondents.

Table 1: Respondents' Characteristics

Respondents' Characteristics	Category	Frequency	Percentage (%)
Gender	Male	214	77
Gender	Female	66	23
Age (Years)	26-30	6	2
Age (Years)	31-36	43	16
Age (Years)	>36	231	82
Destination Region	Jakarta	82	30
Destination Region	Batu	56	20
Destination Region	Bandung	60	21
Destination Region	Bogor	45	16
Destination Region	Surabaya	37	13
Education Level	Senior High School / Diploma	7	3
Education Level	Bachelor (S1)	244	87
Education Level	Master (S2)	29	10
Position	Operational Manager	181	65
Position	Public Relations Head	12	4
Position	Owner	87	31
Total Respondents		**280**	**100**

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

The sample was predominantly male, accounting for 77% of participants, while 82% were aged above 36 years. Respondents aged 31-36 years represented 16% of the sample, whereas those in the 26-30 age category accounted for the remaining 2%. In terms of educational attainment, bachelor's degree holders comprised the largest group at 87%, followed by master's degree holders at 10% and respondents with senior high school or diploma qualifications at 3%.

With respect to organisational roles, operational managers constituted 65% of the respondents, owners accounted for 31%, and public-relations heads represented 4%. The geographical distribution was proportional across the selected cities, with Jakarta contributing 30% of respondents, Bandung 21%, Batu 20%, Bogor 16%, and Surabaya 13%. Overall, the respondent profile indicates substantial representation of experienced managerial personnel from major human-made tourism centres, consistent with the study's purposive sampling approach and its focus on decision makers familiar with green destination practices.

Validity and Reliability Test of the Research Variable

Assessment of the outer model demonstrated that the retained indicators exhibited strong loadings on their respective constructs. The observed loading intervals were 0.828-0.923 for green product innovation, 0.818-0.910 for green process innovation, 0.811-0.864 for green technological innovation, 0.767-0.993 for green organizational innovation, 0.869-0.933 for green commitment, 0.822-0.936 for green attractiveness, and 0.788-0.857 for the sustainable green human-made tourism destination. Table 2 further shows that composite reliability values ranged between 0.827 and 0.965, while AVE values varied from 0.680 to 0.843. Since all reported statistics surpassed the recommended cut-off levels, the measurement model demonstrates satisfactory convergent validity and construct reliability (Joseph F. Hair et al., 2022). On this basis, the analysis proceeded to estimation of the structural model.

Table 2: Validity and Reliability Test of the Research Variable

Variable / Indicator	Loading Range	CR > 0.70	AVE > 0.50	Conclusion
Green Product Innovation	0.828-0.923	0.909	0.781	Valid and Reliable
Green Process Innovation	0.818-0.910	0.914	0.726	Valid and Reliable
Green Technological Innovation	0.811-0.864	0.827	0.703	Valid and Reliable
Green Organizational Innovation	0.767-0.993	0.937	0.843	Valid and Reliable
Green Commitment	0.869-0.933	0.965	0.822	Valid and Reliable
Green Attractiveness	0.822-0.936	0.904	0.764	Valid and Reliable
Sustainable Green Human-Made Destination	0.788-0.857	0.927	0.680	Valid and Reliable

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

Model Fit

Table 3 reports the complementary goodness-of-fit statistics for the estimated model. The absolute fit measures indicate an acceptable level of model fit, with GFI = 0.90, RMSEA = 0.072, and SRMR = 0.057. The incremental fit measures also fall within satisfactory ranges, as reflected by NFI = 0.915, TLI/NNFI = 0.921, and CFI = 0.936. Although AGFI = 0.837 represents a marginal value, the combined pattern of fit statistics provides sufficient evidence of overall model adequacy for hypothesis testing. Together with the satisfactory measurement-model results, these findings indicate that the estimated model demonstrates an adequate correspondence with the observed data and therefore provides an appropriate basis for interpreting the structural relationships.

Table 3: Model Fit Test Results (Goodness of Fit)

Overall Fit	Result Value	Standard Value	Conclusion
GFI	0.90	>= 0.90	Good Fit
RMSEA	0.072	<= 0.08	Good Fit
SRMR	0.057	<= 0.08	Good Fit
NFI	0.915	> 0.90	Good Fit
TLI / NNFI	0.921	> 0.90	Good Fit
CFI	0.936	>= 0.90	Good Fit
AGFI	0.837	> 0.90	Marginal Fit

Structural Model Results

Table 4 and Figure 2 present the estimated structural relationships. Green product innovation has a positive and statistically significant relationship with the sustainable green human-made tourism destination (beta = 0.584, t = 8.830, $p < 0.001$), thereby supporting H1. An even larger positive effect is observed for green process innovation (beta = 0.870, t = 7.191, $p < 0.001$), providing support for H2. These findings identify product and process innovation as the strongest direct contributors to destination sustainability within the proposed model.

In contrast, green technological innovation demonstrates a statistically significant negative relationship with the sustainable green human-made tourism destination (beta = -0.363, t = 2.214, p = 0.028). Consequently, H3 is not supported in its hypothesized positive direction. Green organizational innovation also fails to reach statistical significance (beta = 0.022, t = 0.352, p = 0.725), resulting in the rejection of H4. Together, these results demonstrate that the sustainability implications of green innovation vary considerably across its individual dimensions and cannot be assumed to be uniform. The moderating analysis for green commitment produces a selective pattern. Its interaction with green product innovation is positive and significant (beta = 0.136, t = 2.404, p = 0.017), supporting H5. Although the interaction between green commitment and green process innovation is positive (beta = 0.135, t = 1.915, p =

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

0.057), it does not achieve the five percent significance threshold, and H6 is therefore not supported. The interaction involving green technological innovation is also statistically insignificant (beta = -0.110, t = 1.261, p = 0.209), leaving H7 unsupported. By contrast, the interaction between green commitment and green organizational innovation is positive and statistically significant (beta = 0.177, t = 2.858, p = 0.005), providing support for H8.

Green attractiveness significantly moderates all four innovation relationships, although the direction of these effects differs from the initially proposed strengthening pattern. Its interactions with green product innovation (beta = -0.151, t = 2.705, p = 0.007), green process innovation (beta = -0.338, t = 3.559, p < 0.001), and green organizational innovation (beta = -0.222, t = 3.282, p = 0.001) are statistically significant but negative. Accordingly, H9, H10, and H12 receive statistical support only in terms of significant moderation, with the observed effects running contrary to the hypothesized positive direction. In contrast, the interaction between green attractiveness and green technological innovation is positive and significant (beta = 0.408, t = 3.417, p = 0.001), supporting H11.

Overall, the structural estimates reveal a differentiated configuration of relationships. Green product and green process innovation emerge as the principal direct contributors to sustainability, whereas green technological innovation has a significant adverse average association. Green organizational innovation becomes consequential when accompanied by stronger green commitment, while green attractiveness enhances the technological pathway but weakens the product, process, and organizational pathways. This pattern provides a more nuanced empirical basis for understanding how different forms of green innovation contribute to sustainability within human-made tourism destinations.

Table 4: Results of Structural Model Estimation (Overall Model)

Hypothesis	Path Analysis	Beta (O)	t-Value	Decision
H1	GProd -> GSus	0.584	8.830	Supported
H2	GProc -> GSus	0.870	7.191	Supported
H3	GTech -> GSus	-0.363	2.214	Supported
H4	GOrg -> GSus	0.022	0.352	Not Supported
H5	GProd x GCom -> GSus	0.136	2.404	Supported
H6	GProc x GCom -> GSus	0.135	1.915	Not Supported
H7	GTech x GCom -> GSus	-0.110	1.261	Not Supported
H8	GOrg x GCom -> GSus	0.177	2.858	Supported
H9	GProd x GAtt -> GSus	-0.151	2.705	Sig. Opposite
H10	GProc x GAtt -> GSus	-0.338	3.559	Sig. Opposite
H11	GTech x GAtt -> GSus	0.408	3.417	Supported
H12	GOrg x GAtt -> GSus	-0.222	3.282	Sig. Opposite

Sources: SmartPLS 4 Output (2025)

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

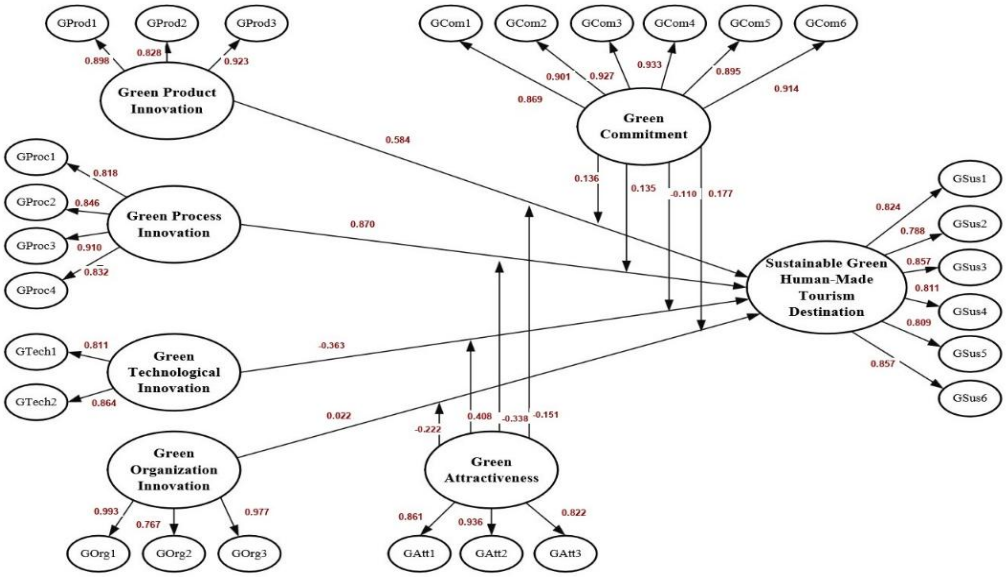

Figure 2: Structural Model Testing

DISCUSSION

Integration with Prior Tourism and Sustainability Scholarship

Collectively, the findings favour a move away from treating green innovation as a uniform construct and towards explanations that distinguish individual innovation dimensions and account for contextual conditions. The positive relationships observed for green product and green process innovation are consistent with evidence from hospitality research showing that environmentally improved offerings and cleaner operational systems can enhance sustainability performance (Asadi et al., 2020; Elzek et al., 2021; Xie et al., 2006). Conversely, the negative direct relationship involving green technological innovation cautions against if technological advancement will automatically produce better sustainability outcomes in human-made destinations, particularly where organisational readiness, implementation capabilities, and cost structures differ substantially.

The findings concerning the two moderators provide further refinement of the existing literature on green commitment and green attractiveness. Green commitment has a selective moderating role, strengthening relationships that appear to depend more heavily on strategic managerial support and organisational endorsement. Green attractiveness, by comparison, can facilitate the translation of technological innovation into sustainability while weakening other innovation pathways. These differentiated effects indicate that sustainability transitions within human-made destinations are inherently configurational, with outcomes shaped not only by the particular innovation mechanisms adopted but also by the supporting conditions under which those

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

mechanisms are implemented (Franceschini et al., 2016; Pan et al., 2018; Weaver, 2006).

Green Product and Process Innovation as Primary Drivers

The substantial positive effects associated with green product and green process innovation demonstrate that meaningful improvements to tourism offerings and service operations are fundamental to the sustainability of human-made destinations. This evidence is consistent with previous research showing that green innovation can enhance sustainability performance within tourism and hospitality (Asadi et al., 2020; Elzek et al., 2021) and with studies linking process-oriented innovation to improved environmental and competitive performance (Chiou et al., 2011; Xie et al., 2006). For Indonesian human-made destinations operating under substantial fixed costs and increasing competitive pressures, environmentally designed products and digitally enabled, resource-efficient processes therefore appear to offer particularly direct and dependable pathways towards green sustainability.

At the product level, green innovation incorporates sustainability into the visitor experience by means of environmentally responsible materials, educational activities, and tours connected with local communities. Green process innovation operates more broadly across the service system by reducing unnecessary resource consumption, operational friction, and waste in both customer-facing and supporting activities. The comparatively large coefficient associated with process innovation indicates that redesigning operational systems may generate greater sustainability benefits than implementing isolated improvements to individual products. This may be because operational processes continuously regulate the movement and consumption of energy, materials, information, and labour. Destination managers aiming to achieve improvements that can be implemented consistently at scale should therefore regard process redesign as a strategic sustainability intervention rather than merely an administrative adjustment.

The simultaneous significance of green product and green process innovation further points towards a potentially complementary relationship between these dimensions. Environmentally responsible products are more convincing when their delivery is supported by efficient and low-waste operational processes, while improvements to service processes acquire greater market relevance when visitors encounter their environmental benefits through tangible green offerings. This interdependence reinforces the central principle of sustainability theory that effective greening requires coordinated and integrated practices rather than isolated environmental interventions.

The Ambivalent Role of Green Technological Innovation

The statistically significant negative coefficient associated with green technological

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

innovation carries important theoretical implications. This finding should not be interpreted as evidence that green technology is inherently detrimental to sustainability. Rather, within the present sample, greater reported adoption of technological innovations corresponds to lower perceived destination green sustainability. Several factors may explain this relationship, including substantial investment and maintenance requirements, inadequate human-capital capabilities, incompatibility between adopted technologies and destination operations, and temporary disruption during implementation. Under these circumstances, technological innovation may become an operational burden and divert financial and managerial resources away from other sustainability-oriented activities.

This interpretation is consistent with implementation perspectives suggesting that the effectiveness of eco-innovation depends on complementary capabilities and organisational readiness (Dong et al., 2014; Harald Buijtendijk, 2018). Human-made destinations that introduce sophisticated technological systems without providing adequate employee training, maintenance arrangements, and operational integration may fail to realise either environmental or commercial benefits. The observed negative association therefore highlights the limitations of technology-first approaches to greening, particularly when destinations lack the absorptive capacity required to implement and manage advanced systems effectively.

The positive moderating influence of green attractiveness on the technological relationship provides further insight into this otherwise negative association. When technological investments are accompanied by visible and compelling green features that visitors can recognise and experience, their contribution to sustainability becomes stronger. The visibility and experiential interpretation of environmental technologies may help transform technical investments into sustainability outcomes that are more readily understood and valued by both visitors and organisational personnel. Without such supporting cues, technological systems may remain largely invisible to users, generate considerable costs, and have limited connection with the destination's broader sustainability narrative. From a managerial perspective, green technology should therefore be complemented by effective communication and experiential design that clearly conveys its environmental contribution to visitors and staff.

Why Green Organizational Innovation Is Not Directly Significant

The absence of a significant direct relationship between green organizational innovation and destination sustainability indicates that initiatives such as employee training, external green communication, and environmental monitoring do not necessarily produce sustainability improvements on their own. Without corresponding resource commitments, supervisory mechanisms, and performance-related consequences, organisational initiatives may remain largely ceremonial and have limited influence on actual destination practices. This interpretation supports the view that environmental

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

identity and organisational legitimacy become consequential only when they are converted into tangible and consistently enacted practices (Gürlek & Tuna, 2018; Sanjay Sharma, 1999).

The significant moderating effect of green commitment on the organizational pathway provides an important qualification to this finding. Stronger commitment appears to provide the strategic direction necessary to transform organisational green initiatives into actions that contribute meaningfully to sustainability. Thus, the effectiveness of organizational innovation is conditional rather than universal: its contribution becomes more evident when senior leadership positions sustainability as a substantive strategic objective rather than treating it as a symbolic addition to existing practices. This conditional relationship further demonstrates the importance of examining green commitment as a moderating factor instead of presuming that organizational innovation produces consistent sustainability effects across all destination contexts.

Green Commitment as a Selective Moderator

Green commitment enhances the product and organizational pathways, whereas its moderating influence on the process and technological pathways does not reach conventional levels of statistical significance. This differentiated pattern is theoretically meaningful. Product and organizational innovations tend to rely more heavily on managerial direction, organisational culture, and coordination across functional units. In comparison, process and technological innovations are often shaped by technical requirements, supplier and vendor arrangements, existing infrastructure, and the need to recover investment costs. Consequently, expressions of managerial commitment may not, by themselves, be sufficient to modify these technically oriented pathways unless they are accompanied by appropriate capability development and effective integration into operational systems (El-Kassar & Singh, 2019; Haldorai et al., 2022; Hambrick, 2007).

Although the interaction involving process innovation approaches statistical significance, the result nevertheless suggests that more substantive forms of commitment could influence process-related outcomes when embedded within standard operating procedures, resource allocation, and budgeting practices. Future research should therefore differentiate between symbolic expressions of commitment and commitment that has been translated into concrete organisational practices. From a managerial perspective, boards and owners should convert green commitment into clearly defined targets, dedicated budgets, measurable responsibilities, and regular performance reviews rather than depending solely on mission statements or general declarations of environmental intent.

Green Attractiveness: Amplification and Attenuation

Green attractiveness strengthens the contribution of technological innovation to

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

sustainability but, in contrast, reduces the effects associated with product, process, and organizational innovation. Several mechanisms may account for this differentiated pattern. First, the visibility of attractive green features may create an overshadowing or image-substitution effect, whereby managers and stakeholders place greater emphasis on easily observable environmental cues while giving less attention to less visible improvements in products, processes, and organisational practices. Second, attentional competition may arise when resources and managerial attention are directed towards green-oriented marketing and aesthetic presentation rather than towards improvements in core operational systems. A further explanation may involve measurement overlap in managerial perceptions; whereby highly appealing environmental imagery influences how stakeholders assess the destination's overall sustainability performance.

These findings add greater complexity to existing research concerning green attractiveness and environmentally oriented consumer responses (Asadi et al., 2020; Suki, 2016). Rather than functioning as an inherently beneficial moderating condition, green attractiveness may generate different consequences depending on how it interacts with underlying innovation practices. This is particularly important for human-made destinations characterised by substantial investment in thematic design and visual spectacle. Green attractiveness is therefore most effective when it communicates and reinforces genuine operational improvements; when it is pursued independently, it may divert attention from substantive sustainability efforts and weaken broader greening processes. The managerial implication is that green attractiveness should function as a visible communication component of authentic environmental systems rather than being used as a replacement for meaningful operational transformation.

THEORETICAL AND PRACTICAL IMPLICATIONS

From a theoretical perspective, the study extends sustainability theory by developing a multidimensional green-innovation framework incorporating two moderators within the context of human-made tourism destinations. The findings demonstrate that different forms of innovation cannot be assumed to generate equivalent sustainability outcomes and that moderating conditions may selectively strengthen, weaken, or even alter the direction of relationships. In this respect, the study moves beyond conventional linear models centred on direct effects and contributes to a more configurational perspective in which the sustainability implications of greening depend on the combination of innovation dimensions and contextual conditions within designed tourism environments.

For DMOs, the findings indicate that priority should be given to environmentally designed tourism products and resource-efficient green processes. Investments in green technologies should be accompanied by appropriate organisational readiness, employee training, and visitor-oriented communication that enables tourists to recognise and understand their environmental value. Similarly, organisational green initiatives require

Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

credible and sustained support from senior management to become embedded in routine practices. Green attractiveness should be used to demonstrate authentic environmental practices rather than being treated as an independent image-building strategy. Policymakers can further facilitate these efforts through capability-development programmes, incentives based on verified environmental performance, and regulatory guidance that limits superficial greening initiatives lacking substantive operational foundations.

CONCLUSION AND FUTURE RESEARCH

Destination organisations should adopt a staged green transformation strategy, beginning with assessments of existing products and operations to identify waste-reduction opportunities and environmentally responsible visitor offerings. Green technologies should be introduced alongside adequate organisational capabilities, employee training, environmental monitoring, and clear communication. Senior management should embed these practices within performance systems, while green attractiveness campaigns should emphasise verified environmental achievements rather than image-based claims.

Future research should examine interaction effects and destination differences through graphical and multi-group analyses, while incorporating objective measures such as energy, water, and waste consumption. Comparative studies across Indonesian regions and other countries, together with visitor assessments, could further clarify how green innovation translates into sustainability outcomes. The findings show that green product innovation and green process innovation are the strongest positive contributors to sustainable green human-made tourism destinations in Indonesia. Green technological innovation has a significant negative association, whereas green organizational innovation has no significant direct effect. Green commitment strengthens the effects of product and organizational innovation, while green attractiveness strengthens the technological innovation relationship but weakens those of product, process, and organizational innovation. Overall, green innovation contributes differently across dimensions and depends on specific moderating conditions.

The study contributes by integrating four green innovation dimensions with two moderators in privately managed human-made tourism destinations across five Indonesian cities. The results indicate that sustainability requires a configuration of complementary practices rather than uniform adoption of all innovation types. Managers should prioritise green products and resource-efficient processes, introduce technologies when organisational readiness exists, and ensure that organisational initiatives are consistently implemented and monitored. Policymakers can support this transition through capability development, performance-based incentives, and standards that distinguish substantive environmental improvements from cosmetic sustainability claims. The study is limited by its focus on five Indonesian cities, reliance on managerial

self-reports, cross-sectional design, and exclusion of socio-cultural and community-level moderators. Future research should compare artificial and natural destinations, employ longitudinal or mixed-method designs, and examine green knowledge, local wisdom, tourist responses, and objective environmental indicators to better explain sustainable outcomes.

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Vol: 18 **No:** 1 **Year:** 2026 **ISSN:** 2146-0744 (Online) (**pp.**170-196) **Doi:** 10.34109/ijebeg.2026180109

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