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Exploring sustainability among tourism service providers: The development of an environmental model Canvas

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ABSTRACT

The tourism industry, a cornerstone of the global service economy, faces increasing pressure to align its operations with the UN Sustainable Development Goals, yet existing business model frameworks like the Business Model Canvas (BMC) and its sustainability-focused adaptation, the Triple Layered Business Model Canvas (TLBMC), remain predominantly product-oriented and ill-suited for the intangible, experiential nature of services. This conceptual paper addresses this gap by introducing the Environmental Model Canvas (EMC), a novel framework designed to help service-oriented tourism businesses strategically manage their ecological sustainability. The EMC was developed through a two-stage methodology: first, a systematic literature review of existing sustainability canvases, and second, qualitative analysis of data obtained from semi-structured interviews with accommodation providers, operators, and coordinators in Sarawak, Malaysia. The findings confirmed a significant absence of service-specific sustainability frameworks and revealed that key elements of the TLBMC's environmental layer, such as 'End of Life,' were largely irrelevant for service providers. This misalignment necessitated the inductive development of the EMC, which redefines environmental value creation around service-specific components including Green Value Propositions, the role of Key Stakeholders in co-creating value, and the Behavioural Impacts on environmental customer segments. The EMC contributes theoretically by extending the TLBMC into the underexplored service context, framing the consumer as an active agent in environmental stewardship, while managerially, it provides tourism operators and policymakers with a practical instrument to design experiences that foster pro-environmental behaviour and enhance long-term resilience in the pursuit of sustainable tourism development.

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1. INTRODUCTION

The tourism industry stands as one of the most significant pillars of the global service economy, contributing substantially to employment, economic growth, and cultural exchange worldwide. According to the World Travel and Tourism Council, the tourism sector accounts for approximately 10% of global gross domestic product and supports one in every ten jobs globally. However, this economic significance is accompanied by a growing recognition of tourism's environmental footprint. From carbon emissions generated by air travel to the degradation of natural habitats through unchecked infrastructure development, the industry faces mounting pressure to reconcile its operations with the urgent imperatives of ecological sustainability. The United Nations Sustainable Development Goals (SDGs), particularly Goal 12 (Responsible Consumption and Production) and Goal 13 (Climate Action), provide a clear mandate for tourism businesses to adopt practices that minimise environmental harm while maximising positive contributions to host communities and ecosystems.

Sustainability in tourism is broadly understood as encompassing three interrelated dimensions: economic viability, environmental responsibility, and social benefit (Baloch et al., 2023). For service-oriented businesses such as hotels, tour operators, and travel agencies, this triple bottom line approach necessitates a fundamental rethinking of how value is created, delivered, and captured. Unlike manufacturing firms, where environmental impacts are often concentrated in production processes and material outputs, service businesses generate ecological consequences through indirect yet powerful mechanisms. These include energy consumption in facilities, waste generation from guest activities, and perhaps most significantly, the ability to shape environmental attitudes and behaviours through experiential offerings (Ardoin et al., 2015; Rosenblum et al., 2000). A guided eco-tour that fosters emotional connections with nature, for instance, may produce long-term conservation outcomes that extend far beyond the immediate service encounter.

Given these unique characteristics, the tools available to tourism managers for integrating sustainability into their business models call for further study. Among the most widely adopted strategic planning tools is the Business Model Canvas (Osterwalder & Pigneur, 2013), though it has been critiqued for omitting environmental and social dimensions (Stubbs & Cocklin, 2008). In response, the Triple Layered Business Model Canvas by Joyce and Paquin (2016) adds environmental and social layers and has been applied successfully in product-oriented sectors such as manufacturing (García-Muiña et al., 2020), agriculture (Mili & Loukil, 2023), and the fashion industry (Hurriyati et al., 2023). However, the TLBMC remains grounded in the logic of tangible goods production, incorporating elements such as 'Materials,' 'Production,' and 'End of Life' that assume physical inputs and outputs. These concepts translate poorly to service contexts such as tourism, where value is co-created through intangible experiences, human interactions, and information exchange, and where 'End of Life' represents not disposal but the culmination of a visitor's journey, memories, and subsequent behavioural changes. The prevailing frameworks, therefore, fail to capture the nuanced ways in which service providers generate environmental value.

This conceptual gap is particularly problematic given the scale and growth of the tourism sector, as well as its potential to act as a catalyst for environmental stewardship. Emotionally powerful experiences, such as witnessing the vulnerability of coral reefs or encountering wildlife in their natural habitats, can strengthen pro-environmental values and encourage lasting behavioural change among tourists (García-Muiña et al., 2020). Service providers are thus uniquely positioned to influence not only their own operational footprint but also the ecological consciousness of their customers. To harness this potential,

managers require strategic tools that reflect the experiential, stakeholder-driven, and process-oriented nature of their businesses.

Given this conceptual gap, the present study pursues three primary research objectives. The aims are: first, to critically evaluate the applicability of the TLBMC within service-oriented tourism contexts, identifying its conceptual mismatches with intangible, experience-based value creation. Second, to develop a novel EMC tailored specifically for tourism service providers, reconfiguring environmental value elements such that concepts like 'End of Life' are replaced with 'Post-Experience Behavioural Impact' and 'Materials' with 'Experiential Resource Use'. Third, to empirically ground the EMC framework using qualitative data collected from accommodation providers and tour guides in Sarawak, Malaysia, thereby generating practical insights for managers seeking to integrate ecological responsibility with operational competitiveness. Accordingly, this study addresses the following research questions: (1) How do existing sustainability business model canvases fail to capture the unique environmental mechanisms of tourism services? (2) What components should constitute an environmental canvas for service businesses, and how do these differ from product-oriented canvases? (3) In what ways can tourism operators in Sarawak leverage such a canvas to align customer experiences, stakeholder collaboration, and long-term ecological outcomes?

The present study addresses this gap by introducing the Environmental Model Canvas (EMC), a novel framework designed specifically for service-oriented tourism businesses. Building on the foundational logic of the BMC and TLBMC, the EMC reimagines the environmental layer to align with the characteristics of service delivery. It emphasises elements such as green value propositions, the role of key stakeholders in co-creating environmental outcomes, and the behavioural impacts on customer segments. The framework is informed by a systematic literature review of sustainability business model canvases and enriched by qualitative field data collected from accommodation providers and tour guides in Sarawak, Malaysia. By offering a tool that is both theoretically grounded and practically relevant, this paper contributes to the ongoing development of sustainable business models in the service sector. It responds to recent calls for research that extends sustainability frameworks beyond manufacturing contexts (Adiningtyas & Millanyani, 2025) and provides tourism operators with a means to navigate the complex interplay of ecological responsibility, customer expectations, and long-term competitiveness.

2. LITERATURE REVIEW

2.1 Sustainability Business Model Canvas

The Business Model Canvas (BMC), introduced by Osterwalder and Pigneur (2013), revolutionised strategic planning by providing a visual and intuitive framework comprising nine building blocks that describe how organisations create, deliver, and capture value. Its simplicity and adaptability have led to widespread adoption across industries. However, critics have long noted that the original BMC prioritises economic value creation while overlooking environmental and social dimensions, rendering it inadequate for businesses pursuing sustainability objectives (Bocken et al., 2014; Schaltegger et al., 2016).

Table 1. Business model canvas

Key partners	Key activities Key resources	Value propositions	Customer relationships Channels	Customer segments
Cost	Revenue streams			

In response to this limitation, scholars have developed various adaptations that integrate broader sustainability concerns. The most significant contribution came from Joyce and Paquin (2016) who proposed the Triple Layered Business Model Canvas (TLBMC). This framework extends the original BMC by adding two distinct layers: an environmental layer based on a lifecycle perspective, and a social layer focused on stakeholder interests. The TLBMC enables firms to visualise their business models across all three dimensions of the triple bottom line, supporting strategic innovation towards sustainability and circular economy practices (Lewandowski, 2016; Pieroni et al., 2019).

TLBMC has demonstrated utility across multiple product-oriented sectors. Chen et al. (2020) applied the framework to examine sustainability transitions in the context of circular economy implementation, while Basile (2021) utilised it to enhance sustainability practices in the agri-food industry. In the manufacturing sector, Rauter et al. (2017) employed sustainability-focused business model frameworks to analyse value creation mechanisms, and Nosratabadi et al. (2019) conducted a comprehensive review of sustainable business model innovations across various industries. Morioka et al. (2017) further emphasised the importance of integrating sustainability into business model design through systematic frameworks.

Despite these diverse applications, a notable gap persists in the literature. Sustainability-oriented business model frameworks remain predominantly oriented towards businesses producing tangible goods, with environmental layer elements such as 'Materials,' 'Production,' and 'End of Life' assuming physical product lifecycles (Evans et al., 2017). Their application in service-oriented contexts, particularly tourism, remains underexplored (Reinhold et al., 2017; Todeschini et al., 2017). This oversight is significant given that service businesses generate environmental impacts through fundamentally different mechanisms than manufacturers, primarily via indirect effects and the shaping of consumer attitudes and behaviours (Jindal, 2025). The absence of service-specific sustainability frameworks thus represents a critical gap requiring scholarly attention.

2.2 Tourism Service Providers and Environmental Impacts

The relationship between tourism service providers and environmental impacts has garnered increasing attention as the industry confronts its ecological responsibilities. Unlike manufacturing sectors where environmental consequences centre on production processes and material outputs, tourism services generate impacts through fundamentally different mechanisms that require distinct analytical approaches.

Tourism services produce both direct and indirect environmental consequences. Direct impacts include energy consumption in accommodation, waste generation from guest activities, and carbon emissions from transportation (Kanwal et al., 2024). Xia et al. (2022) demonstrated that hotels contribute the most significant carbon emissions among tourism sectors, particularly through indirect supply chain effects, with emissions largely resulting from food and tobacco product manufacturing. This finding underscores the importance of considering the entire value chain when assessing service providers' environmental footprints, as operational boundaries often obscure upstream ecological costs.

Beyond operational impacts, tourism services exert influence through experiential and behavioural mechanisms. Liu et al. (2025) investigated how immersive nature-based experiences can cultivate pro-environmental behaviours. They found that virtual nature experiences sparked inspiration processes that subsequently increased pro-environmental behavioural intentions one month after exposure. This suggests that service experiences can function as catalysts for lasting ecological consciousness. Services, being simultaneously produced and consumed, involve interactive processes where consumer mindsets are shaped through emotionally powerful encounters.

The capacity of tourism services to influence environmental attitudes has significant strategic implications. Khuong et al. (2025) examined green innovation practices in hospitality, revealing that such practices significantly impact guests' satisfaction and return intentions through the mediating roles of green hotel image. Environmental initiatives thus represent not merely operational considerations but strategic assets that shape customer perceptions. Similarly, Kaewmorakot et al. (2024) identified critical environmental responsibility practices for tour operators, including resource efficiency, climate change mitigation, and waste management systems.

The indirect nature of many service-sector environmental impacts complicates traditional assessment. Unlike tangible goods where concerns centre on production and waste, tourism services influence ecological outcomes through design, messaging, and embedded values. Environmental Impact Assessment methodologies, including Ecological Footprint analysis (Khezri et al., 2023), Life Cycle Assessment (Hosseinzadeh-Bandbafha et al., 2022), and Triple Bottom Line frameworks (Ahmad et al., 2023), have been adapted for tourism, though challenges persist regarding data availability and the quantification of experiential outcomes.

2.3 Conceptual gap

In sum, while the TLBMC represents a significant advancement in integrating sustainability into business model innovation, its foundational logic remains tethered to the linear material flows and discrete lifecycles characteristic of product-oriented industries. This product-centric bias becomes acutely problematic when applied to tourism services, where value is co-created experientially, environmental impacts are diffuse and indirect, and the 'end-of-life' of a service extends into post-consumption behavioural outcomes rather than physical disposal. What is missing, therefore, is a strategic tool that preserves the multi-layered logic of the TLBMC while fundamentally re-articulating its environmental dimension to reflect the intangible, stakeholder-driven, and processual nature of service delivery. The present study addresses this theoretical void by proposing the Environmental Model Canvas, a framework that replaces production-centric categories such as 'Materials' and 'End of Life' with appropriate service constructs. In doing so, the EMC does not simply adapt the TLBMC but reconceptualises how environmental value is created, delivered, and sustained within service ecosystems.

3. METHODOLOGY

This study employed a two-stage sequential research design to develop the EMC for tourism service providers. The first stage consisted of a systematic literature review to establish the theoretical foundation, while the second stage involved qualitative data collection through semi-structured interviews with tourism service providers in Sarawak, Malaysia.

3.1 Stage 1: Systematic Literature Review

The data for this systematic literature review were collected based on the SPAR-4-SLR (Scientific Procedures and Rationales for Systematic Literature Reviews) protocol, which provides a comprehensive and structured methodology to enhance the transparency, rigor, and reproducibility of review studies (Paul et al., 2021). The review focused on the topic of sustainability in the tourism sector.

To identify relevant studies, a tailored set of search keywords was developed, including "sustainability" AND "service" AND "tourism" AND "environment". These terms were selected to ensure comprehensive retrieval of articles addressing various dimensions of frost-related phenomena. The search was executed using the Scopus database, recognised for its wide coverage of high-impact journals in the scientific and engineering disciplines.

The search was applied to the article title, abstract, and keyword fields. An initial total of 640 documents were retrieved. During the arranging stage of SPAR-4-SLR, filters were applied to refine the dataset. The inclusion criteria limited the search to final-stage journal articles written in English and classified under relevant subject areas such as "Environmental Science", "Social Sciences", "Business, Management and Accounting", "Economics, Econometrics and Finance", and "Energy," among others. After applying these criteria, the final dataset comprised 577 documents published up to 14 April 2026.

3.2 Stage 2: Qualitative Data Collection and Analysis

Table 1. Review procedure

SPAR-4-SLR	Consideration	Decision
Assembling	Search focus	Sustainability in the tourism service industry
	Search keywords	"sustainability" AND "service" AND "tourism" AND "environment"
	Search database	Scopus
	Search field	Article title, Abstract, Keywords
	Search result	640 documents
Arranging	Search period	1 January 2006 to 14 April 2026
	Subject area	"Environmental Science", "Social Sciences", "Business, Management and Accounting", "Economics, Econometrics and Finance", "Energy", "Earth and Planetary Sciences", "Agricultural and Biological Sciences", "Decision Sciences", and "Arts and Humanities"
	Document type	Articles
	Publication stage	Final
	Source type	Journal
	Language	English
	Search result	577 documents
Assessing	Science mapping	- Co-occurrence network
		- Thematic Map
		- Thematic Evolution

Given the nature of the qualitative inquiry, the current study conducted face-to-face interviews across the state of Sarawak, Malaysia. A purposive sampling technique was employed to identify participants who possessed the most relevant knowledge and experience (Lim et al., 2021). The sample comprised accommodation providers, operators and coordinators, who were well positioned to provide rich, firsthand information on the management, operations, and challenges of homestay enterprises. Semi-structured interviews were conducted with 13 homestay owners and operators to gain in-depth insight into their current CBT practices, challenges, and strategies to sustain their operations (Anis & Tan, 2024). This method allowed for the collection of rich, contextual data that reflects the lived experiences of rural communities. All interviews were recorded using a digital audio recorder to ensure an accurate and comprehensive capture of participants' voices. The interviews were transcribed, translated into English, and analysed thematically, guided by the BMC framework, to identify recurring patterns in current practices. Textual data were then transcribed and analysed using thematic analysis to develop themes which were relevant to the research questions.

4. FINDINGS

4.1 Systematic Literature Review

Co-occurrence network

The bibliometric analysis yielded three distinct thematic clusters, which are visualised in the co-occurrence network Fig and summarised with their constituent keywords in Table 2.

Cluster 1 (Red): Tourism Development and Stakeholder Dynamics represents the largest and most diverse research stream, centring on the interplay between sustainability and tourism management. This cluster encompasses keywords including sustainable tourism, tourism development, tourist behaviour, perception, decision making, and competitiveness. The presence of terms such as tourist destination, tourism market, and leisure industry indicates a strong focus on destination-level analysis and market dynamics. Notably, the inclusion of perception, tourist behaviour, and decision making suggests growing scholarly attention to the micro-level psychological and behavioural factors that shape sustainable tourism outcomes. The emergence of COVID-19 as a keyword reflects recent disruptions and their implications for sustainability transitions. Rural tourism, innovation, and commerce indicate diversification into niche tourism segments and business model innovation, while China's prominence suggests the geographic concentration of research in rapidly developing tourism markets. This cluster collectively emphasises that sustainability in tourism services cannot be understood without considering the complex interactions between tourist preferences, destination management strategies, and broader economic forces.

Cluster 2 (Blue): Ecosystem Services and Conservation Science captures the ecological foundations of sustainable tourism. Keywords include ecosystem services, climate change, biodiversity, conservation, coastal zone, and ecology, positioning this cluster firmly within environmental science disciplines. The emphasis on ecosystem services is particularly significant, reflecting a paradigm shift towards valuing nature's contributions to human well-being and recognising tourism as both a beneficiary and potential threat to these services. Coastal zone research indicates attention to vulnerable and tourism-intensive environments where ecological and economic pressures intersect. The cluster's focus on biodiversity and conservation underscores the intrinsic link between tourism's resource base and the need for protective

measures, while climate change emerges as an overarching threat multiplier that complicates long-term sustainability planning.

Cluster 3 (Green): Environmental Management and Policy Responses addresses the governance and operational dimensions of sustainability. Keywords such as environmental sustainability, environmental protection, environmental management, environmental impact, waste management, and land use indicate a focus on practical interventions and regulatory frameworks. The inclusion of human as a keyword acknowledges the anthropogenic drivers of environmental change, while conservation of natural resources bridges this cluster with Cluster 2. Agriculture and land use reflect the intersection of tourism with other economic sectors competing for environmental resources. The presence of review as a keyword suggests this cluster includes substantial synthesising work, indicating a mature subfield concerned with consolidating knowledge and identifying best practices. This cluster collectively represents the "how" of sustainability in which environmental goals can be operationalised within tourism service contexts.

The three clusters reveal complementary perspectives: Cluster 1 emphasises the socio-economic and behavioural dimensions of sustainable tourism services, Cluster 2 provides the ecological baseline and natural capital upon which tourism depends, and Cluster 3 translates these considerations into actionable management frameworks. The absence of strong integration between clusters, however, suggests persistent silos between social science, ecological science, and management research, a gap that frameworks like the EMC can help bridge by providing service-oriented tourism businesses with a holistic tool that integrates stakeholder dynamics, ecological foundations, and environmental management practices.

Table 2. Cluster's keyword

Cluster	Keywords
1 (Red)	Sustainability, sustainable development, tourism, ecotourism, tourism development, sustainable tourism, China, tourist destination, tourism management, decision making, tourism industry, economic development, tourism market, perception, tourist behaviour, competitiveness, leisure industry, rural tourism, innovation, commerce, questionnaire survey, urban planning, COVID-19, marketing
2 (Blue)	Ecosystem services, climate change, biodiversity, economics, economic and social effects, coastal zone, ecology, conservation
3 (Green)	Environmental sustainability, environmental protection, environmental management, human, environmental impact, environmental economics, conservation of natural resources, waste management, land use, agriculture, review

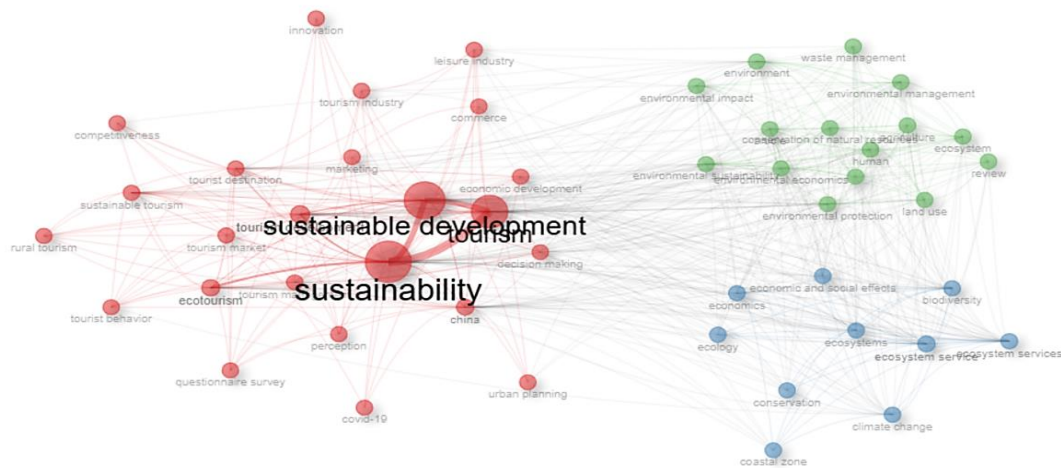


Fig. 1. Co-occurrence network

Thematic Evolution

The analysis of thematic evolution across three time periods (2006-2012, 2013-2019, and 2020-2026) in Fig demonstrates a clear trajectory in tourism sustainability research from foundational impact assessments towards integrated, multi-dimensional frameworks. Each period reflects distinct preoccupations: Period 1 established baseline understandings of tourism-environment interactions, Period 2 diversified into ecosystem services, business strategy, and stakeholder governance, while Period 3 consolidated around global policy frameworks, digital transformation, and regenerative paradigms. Together, these periods chart the intellectual maturation of a field increasingly central to addressing contemporary sustainability challenges.

Period 1 (2006-2012): Foundational Concerns and Geographic Specificity

The initial period of analysis (2006-2012) reveals a research landscape primarily concerned with establishing foundational connections between tourism activities and environmental consequences, with a notable geographic concentration on specific national contexts. During this stage, scholars focused predominantly on understanding the direct environmental impacts of tourism operations while simultaneously exploring the economic and developmental dimensions of the sector.

a. Focus Area 1: Tourism's Environmental Footprint and Impact Assessment

Research in this period demonstrates a concerted effort to quantify and qualify the environmental repercussions of tourism development. Primavera (2006) and Yusoff et al. (2006) provided comprehensive overviews of how human activities, particularly tourism and aquaculture, threaten the sustainability of aquatic ecosystems and coastal zones, emphasising the urgent need for conservation measures and holistic environmental management. This foundational work established the vocabulary and conceptual frameworks for subsequent impact studies. Complementing these broad assessments in Period 2 later on, Zhang et al. (2013) later contributed to this foundational period by developing energy-based evaluation methods for constructed wetlands, demonstrating how large-scale restoration projects could be assessed for their ecological efficiency and sustainability, thereby providing methodological tools for evaluating tourism-related environmental interventions.

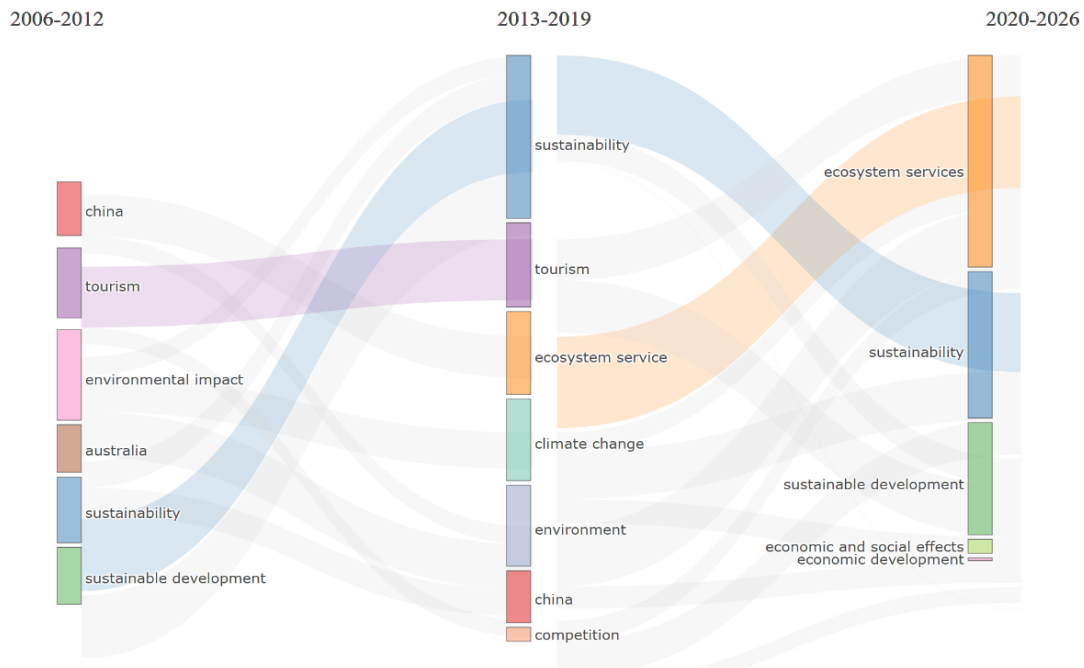


Fig. 2. Thematic Evolution

The relationship between tourism infrastructure and environmental degradation received particular attention. Schaltegger et al. (2016) provided empirical evidence of how camping activities on coastal dunes impact vegetation and ghost crab populations, establishing biological indicators for monitoring human stressors in sensitive environments. Similarly, Zhang et al. (2012) conducted quantitative analyses of tourism disturbance on subalpine meadows in China's Dongling Mountains, identifying indicator species and demonstrating how elevation and tourism intensity gradients influence meadow communities. These studies collectively established that tourism's physical footprint extends beyond obvious infrastructure to include subtle but significant ecological disturbances requiring careful monitoring and management.

b. Focus Area 2: Regional Tourism Development and Sustainability Challenges

A distinctive characteristic of this period is the strong geographic specificity in research, with China and Australia emerging as prominent case study locations. The Chinese context received substantial attention, with Li et al. (2009) analysing the development trajectory of China's forest parks, examining how forest tenure reform, financial crises, and urbanisation were reshaping the management and operation of these important ecotourism destinations. Their work highlighted the tension between recreational demand and ecosystem preservation, a theme that would resonate throughout subsequent research. Complementing this focus, Stone and Smith (2006) examined Parks Victoria's tourism partnership strategy in Australia, outlining the challenges of balancing protection and promotion in national parks while developing appropriate visitor facilities and services. Their analysis of post-bushfire recovery initiatives demonstrated the complex interplay between natural disasters, tourism recovery, and sustainable park management.

The economic dimensions of sustainable tourism also emerged during this period. Zekri et al. (2011) employed travel cost methods to estimate the recreational value of an Omani oasis, demonstrating that irrigated agriculture in desert environments provides significant amenity services for tourism. Their economic valuation provided empirical justification for maintaining traditional agricultural practices based on their tourism value. Stoeckl et al. (2011) similarly contributed by reviewing the economic value of ecosystem services in the Great Barrier Reef, identifying critical knowledge gaps about non-market values and the social distribution of ecosystem benefits. Their work underscored the need for comprehensive valuation frameworks that capture the full range of services provided by tourism-dependent ecosystems.

c. Focus Area 3: Sustainable Tourism Policy and Management Frameworks

The period also witnessed the development of policy-oriented research examining how governance structures and management frameworks could promote sustainability. Scott et al. (2011) articulated the role of climate services in supporting sustainable tourism and adaptation to climate change, arguing that improved weather and climate information would be vital for travellers, tourism businesses, and destinations to adapt in economically, socially, and environmentally sustainable ways. White (2007) conducted interpretive research on visitor perspectives towards alternative transportation in Yosemite National Park, identifying psychological and situational factors influencing travel behaviour. His findings that perceived freedom, convenience, and prior experience shape visitors' transportation choices provided actionable insights for park managers seeking to reduce automobile dependency while maintaining visitor satisfaction.

The service dimensions of sustainable tourism began receiving scholarly attention during this period. Raggi and Petti (2006) investigated integrated environment-quality approaches for designing hotel services, proposing Quality Function Deployment combined with life cycle-based environmental assessment tools to improve customer satisfaction while meeting environmental requirements. This represented an early effort to integrate sustainability considerations directly into service design processes rather than treating environmental performance as an add-on. Alonso and Ogle (2010) extended this service focus by examining environmental sustainability among small and medium tourism enterprises in Western Australia, finding that while operator awareness was high, business demands and added costs presented challenges to fully implementing sustainable practices, particularly regarding water consumption in service areas.

Period 2 (2013-2019): Diversification, Ecosystem Services Integration, and Sustainability Mainstreaming

The second period of analysis (2013-2019) marks a significant maturation and diversification of sustainability research in tourism. During this phase, the scholarly discourse expanded beyond foundational impact assessments to embrace more sophisticated conceptual frameworks, broader geographic coverage, and deeper integration of ecosystem services thinking. The period is characterised by the mainstreaming of sustainability as a core business concern, the emergence of service-oriented perspectives, and increased attention to stakeholder engagement and participatory governance.

a. Focus Area 1: Ecosystem Services as an Integrating Framework for Tourism Sustainability

The concept of ecosystem services emerged as a dominant organising framework during this period, enabling researchers to articulate dependencies between tourism economies and natural capital while revealing complex trade-offs and distributional inequities. Benitez-Capistros et al. (2014) applied the DPSIR framework to the Galapagos Islands, demonstrating how tourism growth, migration, and weak institutional management create cascading environmental impacts, identifying 37 indicators revealing

relationships between biodiversity loss, land use change, and water quality degradation. Complementing this, Riensche et al. (2015) explored Mexico's Costalegre through an ecosystem services lens, identifying freshwater provision and cultural services as most important while revealing unequal benefit distribution between peasant stewards and tourism facilities.

Valuation of ecosystem services received sophisticated treatment. Zabala et al. (2021) proposed a comprehensive approach for valuing agroecosystem services and disservices in Mediterranean areas, finding biodiversity as the most relevant service (38%), followed by recreation and tourism (20%), while disservices contributed 30% of total importance. Chen et al. (2017) integrated ecological footprint and ecosystem services valuation on Liuqiu Island, Taiwan, revealing that while ecosystem service value increased, per capita ecological footprint rose dramatically, demonstrating tourism development was progressively reducing eco-security levels.

Climate change and vulnerability assessment became increasingly integrated with ecosystem services thinking. Kyriazopoulos et al. (2017) analysed European treeline ecosystems using the DPSIR framework, finding locally-specific human-environment interactions have greater influence than global warming, with sustainability enhanced by promoting traditional land use while regulating tourism. Matias et al. (2022) conducted systemic environmental impact assessment on Brazilian island and coastal ecosystems, identifying water pollution, biodiversity loss, and COVID-19 spread as negative impacts, while employment generation emerged as the most prominent positive impact, demonstrating how ecosystem-based approaches inform environmental management decision-making.

b. Focus Area 2: Business Responses, Competitive Advantage, and Service Quality Integration

A significant development during this period was increased attention to how tourism businesses leverage sustainability for competitive advantage while integrating environmental responsibility into service quality frameworks. Martínez et al. (2019) found that green image serves as a predictor of functional image in Spanish certified hotels, influencing customer behavioural intentions. Preziosi et al. (2022) extended this inquiry, identifying hotel green practices as delighting guests if properly delivered, demonstrating that customers positively recognise environmental commitment as a market differentiation strategy.

The relationship between environmental responsibility and financial performance received empirical attention, strengthening business cases for sustainability adoption. Mariño-Romero et al. (2017) revealed that environmental sustainability has a significant positive impact on revenue per available room in Spanish hotels, with reputation acting as a mediating factor, demonstrating that CSR policies represent investment rather than cost. Pulido-Fernández et al. (2019) investigated the bidirectional relationship between tourism growth and environmental sustainability across 139 countries, substantiating that while tourism expansion creates environmental deterioration, environmental compliance contributes to greater tourism growth.

Service quality research increasingly recognised sustainability as a dimension of tourist experience requiring nuanced understanding. Oviedo-García et al. (2019) addressed the service-cape impact on tourist satisfaction in Dominican Republic protected areas, distinguishing between facilities as satisfiers and informational services as dissatisfiers, providing guidance for managers balancing ecological protection with visitor satisfaction. Landon et al. (2018) examined psychological mechanisms underpinning pro-sustainable behaviours through the value-belief-norm model with 623 US tourists, demonstrating that personal norms and biospheric values account for considerable variance in behavioural intent.

The role of certification and voluntary instruments gained prominence. Costa et al. (2019) found that certification helps consumers choose environmentally preferable products while serving as marketing differentiation. de-Miguel-Molina et al. (2014) demonstrated that luxury and sustainability can coexist, with patterns emerging based on resort management practices and willingness to sacrifice certain activities. Chen et al. (2018) proposed a green tourism supply chain model for rural China, demonstrating that decoupling back-stage functions into shared service centres generates positive environmental and economic effects without sacrificing local environments.

c. Focus Area 3: Stakeholder Engagement, Governance, and Participatory Management

Participatory approaches and stakeholder engagement gained significant traction during this period as researchers recognised that sustainable tourism outcomes depend fundamentally on meaningful community involvement and effective governance. Studies such as those by Muñoz Barriga (2017) and Riensche et al. (2015) revealed critical disparities in how tourism benefits are distributed; they found that while local communities are often expected to support conservation, the economic rewards are frequently captured by external companies, leading to resident frustration and hindering the development of genuine environmental stewardship. Both Muñoz Barriga (2017) in Ecuador and Benitez-Capistros et al. (2014) in the Galapagos documented serious challenges including water contamination, invasive species, deforestation, and illegal activities, underscoring that without equitable benefit-sharing, local populations may not develop the environmental awareness needed for long-term sustainability.

Collaborative governance models emerged as a significant theme to address these challenges. Uddivira et al. (2023) developed an influencer ecotourism pathway framework for small island developing states, linking ecotourism attributes to environmental impacts while providing practical guidance for multi-stakeholder collaboration. The importance of structured, participatory decision-making was further reinforced by Lukoseviciute and Panagopoulos (2021), who demonstrated how methodologies incorporating visitor perspectives can identify management priorities that simultaneously enhance experiences and protect natural environments.

Cross-cultural comparisons provided valuable insights into how institutional contexts shape sustainability. Miller-Rushing et al. (2017) compared Chinese and US protected areas, finding that both approaches have strengths and weaknesses regarding conservation and community engagement, yet both suffer from structural funding deficiencies that undermine long-term goals. They observed that Chinese reserves explicitly integrate economic development zones, a point echoed by Chen et al. (2018), who noted the need for governance structures that balance economic efficiency with environmental protection. Collectively, these findings underscore that sustainable tourism depends not merely on technical solutions but fundamentally on inclusive governance processes, equitable economic structures, and the institutional capacity to balance conservation with community development needs.

Period 3 (2020-2026): Sustainable Development Goals Integration, Digital Transformation, and Regenerative Paradigms

The third period of analysis (2020-2026) represents a profound shift in tourism sustainability research, characterised by the integration of global policy frameworks, particularly the UN Sustainable Development Goals (SDGs), the acceleration of digital transformation accelerated by the COVID-19 pandemic, and the emergence of transformative paradigms such as regenerative tourism. This period moves beyond

minimising negative impacts towards actively restoring ecosystems and communities, while embracing technology as both a tool and a subject of critical inquiry.

a. Focus Area 1: Sustainable Development Goals as an Integrating Framework

The adoption of the UN Sustainable Development Goals provided a unifying policy framework that fundamentally reshaped how researchers conceptualise and evaluate tourism sustainability during this period. Studies such as those by Alves et al. (2025) and Ivanov et al. (2023) systematically mapped the contributions of emerging technologies to SDG achievement, demonstrating that artificial intelligence and robotics can foster sustainable environments contributing to multiple goals including decent work, industry innovation, sustainable cities, responsible consumption, and climate action. However, they also emphasised that technology adoption requires careful consideration of trade-offs, as robots and AI systems have environmental impacts related to manufacturing, energy demands, and waste management that must be balanced against their efficiency gains. This nuanced assessment reflected the maturing of sustainability discourse beyond uncritical acceptance towards sophisticated evaluation of complex systems.

The SDG framework also enabled more comprehensive assessments of tourism's multi-dimensional impacts across diverse contexts. Islam et al. (2023) and Farrukh et al. (2023) both examined tourism-environment relationships in developing economies, revealing that while tourism expansion can exacerbate environmental degradation through carbon emissions and resource consumption, good governance, financial inclusion, and innovation can mediate these negative effects and channel tourism towards sustainability. Complementing these findings, Cossengue et al. (2025) and Singh (2021) demonstrated that post-pandemic tourism recovery presents opportunities for transformative change, with tourists increasingly inclined towards sustainable practices and natural destinations, while the combination of community involvement and innovative service delivery maximises benefits for both local populations and environmental conservation. Collectively, these studies underscore that realising tourism's potential contribution to the SDGs requires integrated policy approaches that simultaneously address ecological integrity, social equity, and economic viability while engaging local communities as active participants rather than passive beneficiaries.

b. Focus Area 2: Digital Transformation, Artificial Intelligence, and Smart Tourism

Digital transformation emerged as a dominant theme during this period, with researchers examining how artificial intelligence, big data, and smart technologies are reshaping sustainable tourism across diverse geographic and operational contexts. Chiwaridzo and Chiwaridzo (2024) and Yaling et al. (2025) both demonstrated that strategic integration of robotics, AI, and service automation can significantly enhance tourist experiences while contributing positively to social, economic, and environmental sustainability. The mediating role of social media identified by Yaling et al. (2025) provides evidence-based strategies for designing experience-centric itineraries that trigger digital sharing and channel participation into environmental citizenship behaviours.

Smart tourism applications proliferated across both developed and developing countries' contexts, demonstrating the versatility of digital tools for sustainability outcomes. Pongsuppat et al. (2023) and Díaz-Castillo et al. (2025) both explored how digital platforms can enhance collaboration among stakeholders while improving operational efficiency and sustainability performance. The integration of mobile and WebGIS technologies also advanced significantly, with Nguyen et al. (2023) proposing a platform enabling visitors to access location-based services while allowing authorities to monitor habitat status and

environmental trends, demonstrating how geographic information systems can support both visitor experiences and conservation management.

The application of big data analytics enabled a more sophisticated understanding of tourist behaviour and sustainability outcomes, while also revealing important cross-cultural and generational insights. Aliyah et al. (2025) and Cha and Kim (2026) both utilised large-scale data to examine how technology interfaces with sustainability perceptions and behaviours. Ivasciuc et al. (2025) compared traditional survey data from 399 Romanian Generation Z respondents with AI-generated insights from ChatGPT, revealing important discrepancies: surveys indicated preference for car travel and commercial accommodation while AI predictions favoured air travel and private accommodation, with AI emphasising growing interest in eco-friendly transportation and connections to natural and cultural environments. Their work demonstrated that AI can complement traditional research methods, while its limitations emphasise the need for balanced integration of both approaches for understanding evolving tourist preferences.

c. Focus Area 3: Regenerative Tourism, Climate Resilience, and Post-Pandemic Transformation

The most significant conceptual evolution in this period is the emergence of regenerative tourism as a paradigm extending beyond sustainability towards actively restoring ecosystems and communities. Tomassini and Cavagnaro (2022) and Bizzarri and Micera (2024) both explored how circular economy principles and placemaking can be integrated to envision tourism as an active force for environmental and social regeneration rather than merely minimising harm. Luković et al. (2024) provided empirical evidence from Serbia's Golija-Studenica Biosphere Reserve, revealing that while local stakeholders prioritised ecosystem services bringing economic value, tourists focused more on cultural services, suggesting pathways for symbiotic relationships between humans and nature based on improved quality of life.

Climate resilience and adaptation received urgent attention as researchers examined tourism's vulnerability to accelerating environmental change. Khan et al. (2025) and Farrukh et al. (2023) both analysed tourism-environment relationships under climate stress, revealing that different tourism sub-sectors exhibit varying environmental intensities requiring differentiated governance strategies. Onifade and Haouas (2023) specifically examined air transportation's role in Middle Eastern tourism, finding that while aviation facilitates economic diversification, it constitutes significant environmental impacts necessitating policy measures addressing side effects while maintaining sector growth. Cook et al. (2022) and Skarakis et al. (2023) emphasised the importance of valuing sensitive ecosystems, with Cook et al. (2022) identifying 18 volcanic ecosystem services requiring careful management, and Skarakis et al. (2023) demonstrating how fair entrance fees can simultaneously motivate visitation and fund ecosystem protection.

Post-pandemic transformation extended beyond regenerative thinking to include fundamental reconsideration of tourism's purpose and relationship with host communities. Liutikas (2023) and Singh (2021) both examined how COVID-19 catalysed shifts towards more sustainable and locally-engaged models. Pop et al. (2024) analysed glamping in Romania, finding sustainability attributes including closeness to nature, eco-friendly behaviour, and ecological practices were most important in tourist decisions, demonstrating how the pandemic accelerated demand for sustainable accommodation models that harmonise visitor experiences with environmental protection.

4.2 Qualitative Findings

The interview data were transcribed verbatim and analysed using a thematic coding approach to generate grounded insights (Lim et al., 2021). The data were examined for emerging concepts, codes, and themes development based on data saturation theory (Andriotis, 2024). Quirkos, a robust analytical software, was employed for data sorting, coding, and organisation (Turner et al., 2021), while also assisting in establishing connections between codes, themes, and categories.

The ecological business model of rural homestays in Sarawak can be systematically understood through the Business Model Canvas (BMC) framework, which reveals how environmental value is co-created through interconnected components that integrate community stewardship with conservation practices.

Key Partners form the foundation of the ecological model, involving a multi-stakeholder network of community members, youth groups, local councils, government agencies, NGOs, and educational institutions. Within the local community, youth volunteers often serve as eco-guides who lead visitors on jungle treks and herbal walks, while elders contribute traditional ecological knowledge about medicinal plants and forest resources. External partners play an equally vital role: government agencies such as the Ministry of Tourism, Creative Industry and Performing Arts (MTCP), Sarawak Tourism Board (STB), and Sarawak Forestry Corporation (SFC) provide environmental training, awareness programmes, and monitoring support. STB has conducted training programmes on composting and environmental management, while university students have collaborated with homestay communities on tree-labelling projects to document local flora for educational purposes. Environmental NGOs further assist with eco-awareness campaigns, waste management initiatives, and community education, creating a robust support system that reinforces ecological capacity building.

The following quotes from the transcripts illustrate the key partners of the service providers:

"We received funding for fans and air conditioning from MOTAC."

"The agents call and inform us about the number of visitors coming."

Key Activities centre on environmental maintenance, waste management, eco-tourism delivery, and environmental education. Across both Central and Northern regions, homestay operators regularly organise gotong-royong (community work) clean-ups of rivers, trails, and surrounding natural areas, often in preparation for festivals or major visitor arrivals. In more remote areas where waste collection services are infrequent, some homestays have developed their own composting and recycling systems to mitigate pollution. Eco-tourism activities such as jungle trekking, river bathing, birdwatching, and guided herbal walks not only attract visitors but also embed environmental awareness through experiential learning. As one homestay owner shared, visitors gain appreciation for the natural surroundings through direct participation, with activities designed to educate guests about local flora, fauna, and conservation values.

Key Resources encompass the tangible and intangible assets that enable positive ecological outcomes. Natural assets such as forests, rivers, waterfalls, and biodiversity form the core ecological capital that attracts visitors and supports eco-tourism activities. Community knowledge, particularly the traditional ecological knowledge held by elders, provides interpretive depth to nature-based experiences, with hosts sharing insights on medicinal plants, forest management practices, and sustainable resource use. Physical

infrastructure such as maintained trails, composting sites, and waste management systems further supports ecological operations.

Institutional support from external organisations, including training programmes, funding assistance, and technical expertise, strengthens the capacity of homestay communities to implement and sustain environmental initiatives.

The following quotes illustrate the key activities and key resources:

“Garbage disposal is a significant problem, and we hope the government can create a proper area.”

“The community takes responsibility for maintaining trekking areas and ensuring cleanliness.”

“There is a need for external assistance (government) to manage environmental sustainability and infrastructure improvements.”

The Value Proposition lies in delivering sustainable and authentic eco-tourism experiences that integrate conservation with community-based learning. Visitors gain immersive exposure to Sarawak's rich biodiversity and traditional ecological practices while contributing to environmental preservation through their participation. Homestays that are dedicated to positive environmental actions help guests gain awareness of traditional ecological knowledge, recycling, forest management, and nature-friendly behaviour. This is a transformative experience that extends beyond typical tourism encounters.

Customer Segments targeted by ecological homestays include eco-tourists, students, researchers, educators, and environmentally conscious travellers. Schools and universities frequently organise field trips for cultural immersion and environmental studies, while NGOs bring groups to learn about sustainable living practices. These segments are reached through multiple channels, including on-site experiences, workshops, community engagement, and increasingly through digital platforms such as Facebook, TikTok, and WhatsApp, where homestays showcase their eco-activities and natural attractions.

Customer Relationships are highly participatory and experiential, distinguishing these homestays from conventional accommodations. Visitors are not passive consumers but active participants in eco-activities such as trail maintenance, composting demonstrations, herbal garden walks, and cultural exchanges. This immersive approach fosters deeper engagement, environmental learning, and lasting connections between guests and the communities they visit.

The following quotes illustrate the customer segments and customer relationships:

“We normally promote it through Facebook, and some tourists from other places are aware of it.”

“We operate fully through Facebook, WhatsApp, and use PayPal for our customers.”

“We plan. We have natural resources right in front of us. Like rivers. Even jungle-trekking up there.”

Financial sustainability requires balancing revenue streams against operational costs. Revenue from eco-tourism activities, including guided nature tours, river excursions, and educational visits complements income from eco-products such as local handicrafts, herbal goods, and traditional food offerings. Some homestays also benefit from grants and donations supporting conservation initiatives. However, these revenues must offset a cost structure that includes maintenance of eco-facilities (trails, waste systems), training programmes for eco-guides, and operational costs related to waste management, water, and energy. Opportunity costs such as limiting visitor capacity during conservation periods or scheduling activities

around environmental protection further reflect the delicate balance between profitability and ecological sustainability. Financial constraints remain a key barrier to scaling ecological programmes sustainably, requiring continued support from government and external partners.

The following quotes support these findings:

“The grant I received was used to expand the dining area, as part of an agro-tourism programme.”

“Initial funding was self-sourced, with minimal assistance.”

“There has been some funding provided by the Ministry, but we hope to have more for renovations and improving visitor facilities.”

4.3 Development of the Environmental Canvas Model

Table 3. EMC for Service-Oriented Tourism Businesses

Environmental Model Canvas for Service-Oriented Tourism Businesses				
KEY STAKEHOLDERS THAT CONTRIBUTE TO CREATING GREEN VALUE PROPOSITIONS External stakeholders that collaborate with the service provider to influence the creation of green value propositions • The firm’s external business ecosystem, consisting of business partners, suppliers, representatives, etc. • Government bodies • NGOs, activists, etc. • Media publics	KEY ACTIVITIES THAT CONTRIBUTE TO CREATING GREEN VALUE PROPOSITIONS The firm’s internal operations that can help to generate green value propositions • Operational activities • Organisational culture and practices • Service processes	GREEN VALUE PROPOSITIONS The set of green value propositions produced by the service firm • Outputs that maximise positive impacts on the environment • Outputs that minimise negative impacts on the environment	BEHAVIOURAL IMPACTS AND RELATIONSHIPS The behavioural (degree) and relationship impacts (duration) on customer segments • Degree: minimal impact - maximal impact • Duration: momentary -long term End of life (peripheral products) • Recycle, removal, disposal	ENVIRONMENTAL CUSTOMER SEGMENTS The different segments of the service provider’s clientele that are impacted by the firm’s environmental outputs Examples of environmental customer segments: • Disengaged • Pragmatists • Activists
	KEY RESOURCES THAT CONTRIBUTE TO CREATING GREEN VALUE PROPOSITIONS The firm’s range of resources that provide capacities to generate green value propositions • Cognitive & Affective • Material • Financial • Human resources • Technology & know-how		COMMUNICATION AND DELIVERY OF GREEN VALUE PROPOSITIONS The ways in which the firm’s green value propositions are designed, communicated and executed • Inhouse—outsourced (3rd party, agent, etc.) • In-person—digitally mediated	
ENVIRONMENTAL DETRIMENTS Negative ecological effects produced by the firm			ENVIRONMENTAL BENEFITS Positive ecological effects produced by the firm	

With the findings, an EMC has been developed as shown in Table 3. The EMC developed in this study represents a novel adaptation of the Business Model Canvas framework, specifically designed to address the unique characteristics of service-oriented tourism businesses. Unlike product-based enterprises where environmental impacts are concentrated in production processes and material lifecycles, tourism services generate ecological consequences through intangible, experiential, and stakeholder-driven mechanisms. The EMC captures this complexity by reimagining the traditional business model around green value co-creation. Its structure comprises nine interconnected components: Key Stakeholders that contribute to green value propositions, Key Activities that generate environmental benefits, Key Resources that provide capacities for sustainability, Green Value Propositions that maximise positive ecological impacts and minimise negative ones, Environmental Customer Segments that define the clientele impacted by environmental outputs, Green Value Relationships that shape behavioural and duration impacts on customers, Communication and Delivery mechanisms for executing green propositions, Environmental Benefits that reflect the positive ecological outcomes produced by the firm, and Environmental Detriments that account for negative ecological effects produced by the firm. This architecture enables service providers to visualise not only how they create economic value but also how they generate, deliver, and capture environmental value within their operational ecosystems.

The EMC advances sustainability research in two significant ways. First, it responds to a critical gap identified in the literature. Existing sustainability frameworks such as the Triple Layered Business Model Canvas remain predominantly product-oriented, with elements like 'End of Life' and 'Materials' that translate poorly to service contexts. The EMC replaces these with service-relevant components such as Stakeholder Collaboration, Experiential Delivery Mechanisms, and Behavioural Impact Measurement, reflecting the interactive and process-oriented nature of tourism services. Second, the framework positions the service consumer as an active agent of environmental change. By incorporating Environmental Customer Segments and Green Value Relationships, the EMC acknowledges that the sustainability outcomes of tourism services depend not only on operational practices but also on the environmental awareness, engagement, and behavioural responses of visitors. The dual focus on both the firm's internal capacities and its external influence on consumer behaviour positions the EMC as a comprehensive tool for designing tourism experiences that foster lasting environmental stewardship.

5. DISCUSSION

The findings of this study make several contributions to the intersection of sustainable business model innovation and service dominant logic in tourism. First, the research confirms the conceptual gap identified in the literature: the TLBMC, while valuable for product-oriented sectors, indeed translates poorly to service contexts where value is co-created through intangible experiences rather than linear material flows. Interview data from accommodation providers in Sarawak revealed that practitioners do not conceptualise their environmental footprint in terms of 'Materials,' 'Production,' or 'End of Life' as traditionally framed. Instead, they prioritise stakeholder collaboration, guest education, and the management of experiential resources such as natural scenery and wildlife encounters. This finding aligns with Ardoin et al. (2015) and Rosenblum et al. (2000), who emphasised the unique ability of service providers to shape environmental attitudes through experiential offerings. Second, the preliminary conceptual model derived from the systematic literature review was largely supported by the empirical data, though refinements emerged. Specifically, participants emphasised the importance of 'Communication and Delivery' as a distinct

component governing how green value propositions reach customers, an element underdeveloped in the preliminary model. Additionally, 'End of Life (peripheral products)' emerged as a relevant but secondary construct, applicable only to physical artefacts such as brochures, bottled water, or souvenir packaging rather than the core service itself. Third, the study reveals that tourism operators in Sarawak face context-specific challenges, including limited government incentives, reliance on international supply chains, and varying levels of environmental literacy among customers. These findings suggest that a one-size-fits-all environmental canvas is insufficient; rather, the EMC must be sensitive to local regulatory, cultural, and ecological conditions. Collectively, the discussion underscores that service-oriented tourism businesses require a strategic tool that reflects their operational realities, a gap that the Environmental Model Canvas begins to fill.

6. CONCLUSION

This study sets out to address a fundamental gap in sustainable business model literature: the absence of a strategic planning tool tailored specifically to service-oriented tourism businesses. Through a systematic literature review and semi-structured interviews with accommodation providers and tour guides in Sarawak, Malaysia, the research achieved three primary objectives. First, it critically evaluated the applicability of the TLBMC within service contexts, confirming that its product-centric components such as 'Materials,' 'Production,' and 'End of Life' are conceptually mismatched with the intangible, experience-based nature of tourism value creation. Second, the study developed a preliminary conceptual model comprising six core components: Green Value Propositions, Key Stakeholders, Key Activities, Key Resources, Behavioural Impacts, and Environmental Outcomes. This model served as an analytical framework for the empirical phase. Third, drawing on qualitative field data, the research refined this preliminary model into the Environmental Model Canvas (EMC), a novel framework presented in Section 4.3 that reimagines the environmental layer for service delivery. The EMC emphasises elements such as stakeholder co-creation, post-visit behavioural impact, and the dual bottom line of environmental benefits and detriments, concepts largely absent from existing canvases. Importantly, the study also clarified that, given its exploratory, theory-building design, formal hypotheses were neither appropriate nor required; instead, the research questions and conceptual model served as the guiding framework throughout the inquiry. In sum, this research contributes a practical, empirically grounded tool that enables tourism operators to navigate the complex interplay of ecological responsibility, customer expectations, and long-term competitiveness. While the findings are specific to Sarawak, the EMC's modular design offers transferability to other service-dominated tourism destinations globally.

7. RECOMMENDATION & FUTURE RESEARCH DIRECTION

7.1 Recommendation

To effectively leverage the Environmental Model Canvas, service-oriented tourism businesses should adopt a strategic and integrated approach that moves beyond symbolic green initiatives towards meaningful environmental stewardship. Firms must begin by embedding sustainability across core operations, treating environmental value propositions not as an add-on but as a central component of service design. This requires formalising sustainable operational activities, embedding green values into organisational culture, and redesigning service processes to minimise waste and energy use, with staff training and aligned

incentives being essential for consistency. Equally important is the activation of strategic stakeholder partnerships; tourism businesses should actively collaborate with eco-conscious suppliers, engage with local government bodies to align with regional sustainability goals, and work alongside NGOs to enhance credibility, while leveraging media publics to transparently communicate progress and build reputational trust. Understanding environmental customer segments enables firms to tailor their green value propositions accordingly. For pragmatists, emphasising cost savings and convenience alongside environmental benefits can drive adoption, while activists require deeper transparency, third-party certifications, and verifiable impact metrics. Furthermore, firms must address green value relationships by designing touchpoints that foster lasting behavioural change rather than momentary engagement, ensuring that customer interactions consistently reinforce sustainable practices even at the end-of-life stage through responsible recycling, removal, and disposal options.

To support these strategic efforts, investment in key resources is paramount. Firms should allocate financial resources towards sustainable infrastructure and renewable energy solutions, while simultaneously developing human resources through continuous training that empowers employees to become authentic ambassadors of the firm's environmental mission. Technology and know-how play a critical role as well, enabling data-driven decisions, energy-efficient operations, and digital platforms that enhance transparency and traceability in sustainability reporting. Communication and delivery of green value propositions must be executed with authenticity and consistency across both in-person and digitally mediated channels, whether through direct guest interactions, mobile applications, or third-party booking platforms; the messaging must align with actual practices to avoid accusations of greenwashing. Where internal capabilities fall short, outsourcing specialised sustainability consultants or certified eco-label providers can accelerate progress and lend additional credibility. Finally, businesses must conduct honest and ongoing assessments of their environmental detriments, implementing measurable reduction strategies such as carbon offset programmes, waste minimisation initiatives, and water conservation efforts, while simultaneously identifying opportunities to generate positive environmental benefits like habitat restoration, biodiversity protection, or community-based conservation projects. By systematically addressing both the minimisation of harms and the maximisation of positive contributions, tourism firms can transform environmental responsibility into a durable source of competitive advantage, build long-term resilience against regulatory and market shifts, and contribute meaningfully to the sustainable development of the destinations they serve.

7.2 Future Research Direction

While the EMC developed in this study offers a comprehensive framework for understanding ecological sustainability in service-oriented tourism, several avenues for future research emerge from its application and limitations. First, empirical validation of the EMC across diverse tourism contexts is essential to establish its generalisability and practical utility. The present study focused on rural homestay communities in Sarawak, a context characterised by unique socio-cultural dynamics and ecological conditions. Future research should test the applicability of the EMC in other service sectors such as urban hospitality, eco-lodges, tour operations, and adventure tourism, as well as in different geographic and cultural settings. Comparative studies across multiple contexts would enable refinement of the framework's components, identifying which elements are universally relevant and which require contextual adaptation. Additionally, longitudinal research examining how homestay communities evolve in their environmental practices over time, using the EMC as a monitoring and evaluation tool, would provide valuable insights

into the dynamic nature of green value co-creation and the factors that enable sustained ecological stewardship.

Second, future research should explore the mechanisms through which the EMC's components interact to generate environmental outcomes. The present study identified the nine components of the canvas, but the causal relationships between them remain underexplored. Quantitative studies employing structural equation modelling could test these relationships, while qualitative comparative analysis could identify configurations of components that lead to successful environmental outcomes. Furthermore, the role of Environmental Customer Segments warrants deeper investigation. Future research could examine how different visitor segments respond to varying green value propositions, and how homestays can design communication strategies that effectively move visitors along the environmental awareness continuum. Such research would contribute to both theoretical understanding and practical application, enabling service providers to tailor their environmental offerings to diverse markets.

Third, the integration of the EMC with broader sustainability frameworks presents a promising direction for future inquiry. The canvas currently focuses on ecological sustainability, but its architecture could be extended to incorporate social and economic dimensions, potentially leading to a fully integrated Triple Bottom Line canvas for service-oriented tourism. Future research could explore how the EMC aligns with or complements existing sustainability assessment tools, such as life cycle assessment or the Sustainable Development Goals. Additionally, the digital transformation of tourism presents both opportunities and challenges for the EMC. Research examining how digital technologies can be integrated into the Communication and Delivery component would advance understanding of how technology can enhance green value co-creation. Finally, future studies should investigate the policy implications of the EMC, exploring how government agencies and tourism authorities can adopt the framework to design capacity-building programmes, certification schemes, and funding mechanisms that support the long-term sustainability of service-oriented tourism businesses.

8. IMPLICATIONS

The implications of this study are threefold, spanning theoretical, practical, and policy domains. Theoretically, the EMC contributes to the growing body of sustainability business model literature by extending the logic of the TLBMC beyond product-centric boundaries. Whereas prior adaptations have largely retained manufacturing assumptions, the EMC introduces service-appropriate constructs, such as 'Behavioural Impacts and Relationships,' 'Environmental Customer Segments,' and 'Communication and Delivery of Green Value Propositions.' This responds directly to calls from scholars such as Adiningtyas and Millanyani (2025) for sustainability frameworks that accommodate the unique characteristics of service-dominant logic. Furthermore, the study advances understanding of how environmental value is co-created in tourism ecosystems, highlighting the roles of guides, local communities, and even tourists themselves as active participants rather than passive recipients. Practically, the EMC offers tourism managers a user-friendly, visual tool for strategic planning. Unlike abstract sustainability reports or compliance checklists, the canvas enables operators to map their existing environmental activities, identify gaps, and innovate new green value propositions. For example, a tour operator using the EMC might recognise that while their 'Key Activities' include waste reduction, their 'Communication and Delivery' component lacks explicit messaging about environmental benefits to customers, an actionable insight. The framework also helps managers segment their clientele (e.g., disengaged, pragmatists, activists) and tailor

behavioural interventions accordingly. For accommodation providers in Sarawak, the EMC has been shown to surface contextually relevant priorities, such as reducing single-use plastics, partnering with local NGOs for habitat restoration, and designing post-visit follow-up communications to prolong behavioural impact. Policy and destination management implications are equally significant. The findings suggest that regional tourism boards and government bodies (e.g., Ministry of Tourism, Sarawak) could adopt the EMC as a standardised diagnostic tool for evaluating and certifying sustainable tourism operators. Moreover, the canvas highlights areas where policy intervention is most needed, such as subsidising eco investments, facilitating partnerships between operators and conservation NGOs, or funding digital platforms that help small and medium enterprises communicate their green credentials. Finally, for researchers, this study opens several avenues for future inquiry, including quantitative testing of the EMC's components across larger samples, comparative applications in other tourism destinations (e.g., coastal versus mountain ecotourism), and longitudinal studies examining whether use of the canvas leads to measurable reductions in environmental detriments over time. The EMC is not presented as a finished artefact but as a living framework to be iteratively refined through continued collaboration between academics and practitioners.

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10. CONFLICT OF INTEREST STATEMENT

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts, and declare the absence of conflicting interests with the funders.

11. AUTHORS' CONTRIBUTIONS

Bibiana Lim Chiu Yiong served as Project Leader, overseeing the entire project as main consultant, leading quantitative research design, and training enumerators for data collection. **Komathi Wasudawan** acted as Deputy Team Leader, assisting the Project Leader in project management and providing professional advice while leading the qualitative analysis. **Rodney Lim Thian Hock, Lim Tze Yin, Marc Weissmann, and Irving Ting Shou Hui** served as core members, contributing their respective expertise in qualitative and quantitative research methodologies. **Rodney Lim** and **Lim Tze Yin** drew on their extensive experience in tourism and marketing research from previous industry projects to guide data compilation, recording, and analysis, while also assisting in enumerator training. **Marc Weissmann** contributed expertise in building sustainable businesses and quantitative analysis, and **Irving Ting** applied his economics and accounting background, took the lead in writing this article, synthesising the research findings, and contributing to the qualitative analysis. This complementary skill set enabled the team to execute the two-part research design, integrating systematic literature review with qualitative interviews and quantitative survey data collection across the Central and Northern regions of Sarawak.

12. DECLARATION OF GENERATIVE AI IN THE WRITING PROCESS

During the preparation of this work, the authors used Microsoft Copilot to check the accuracy of grammar and vocabulary. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

13. DATA AVAILABILITY/ SUPPLEMENTARY MATERIALS

All data generated or analysed during this study are included in this published article.

14. ETHICS STATEMENT

This study was reviewed and approved by the Institutional Ethics Committee of Swinburne University of Technology Sarawak. All procedures involving human participants/animal subjects were in fulfilment of the ethical standards of the 1964 Helsinki Declaration. Informed consent was obtained from all participants, and data anonymity was strictly maintained throughout the study.

15. REFERENCES

- Adiningtyas, H., & Millanyani, H. (2025). Assessing the quality of hotel service through the application of text analytics. In *Green Finance and Energy Transition: Innovation, Legal Frameworks and Regulation* (pp. 253 -262). Springer. https://doi.org/10.1007/978-3-031-75960-4_24
- Ahmad, S., Wong, K. Y., & Butt, S. I. (2023). Status of sustainable manufacturing practices: literature review and trends of triple bottom-line-based sustainability assessment methodologies. *Environmental Science and Pollution Research*, 30(15), 43068-43095. <https://doi.org/10.1007/s11356-022-22172-z>
- Aliyah, U., Williady, A., & Kim, H.-S. (2025). An evaluation of green hotels in Singapore, Sentosa Island: A big data study through online review. *Tourism and Hospitality*, 6(1), 24. <https://doi.org/10.3390/tourhosp6010024>
- Alonso, A. D., & Ogle, A. (2010). Tourism and hospitality small and medium enterprises and environmental sustainability. *Management Research Review*, 33(8), 818-826. <https://doi.org/10.1108/01409171011065626>
- Alves, J., Arantes, L., & Moreira, A. C. (2025). AI-powered sustainable tourism: Aligning innovations with the sustainable development goals. *Tourism and Hospitality Research*, 14673584251409416. <https://doi.org/10.1177/14673584251409416>
- Andriotis, K. (2024). From the Editor: Saturation in qualitative tourism studies. *Journal of Qualitative Research in Tourism*, 5(1), 1-6. <https://doi.org/10.4337/jqrt.2024.01.00>
- Anis, M. S., & Tan, M. L. (2024). Exploring OTC drug consumers' perception towards online shopping and digital marketing through qualitative interviews: A sample from Malaysia. *International Journal of Healthcare Management*, 17(1), 168-176. <https://doi.org/10.1080/20479700.2022.2163865>
- Ardoin, N. M., Wheaton, M., Bowers, A. W., Hunt, C. A., & Durham, W. H. (2015). Nature-based tourism's impact on environmental knowledge, attitudes, and behaviour: a review and analysis of the literature and potential future research. *Journal of sustainable tourism*, 23(6), 838-858. <https://doi.org/10.1080/09669582.2015.1024258>
- Baloch, Q. B., Shah, S. N., Iqbal, N., Sheeraz, M., Asadullah, M., Mahar, S., & Khan, A. U. (2023). Impact of tourism development upon environmental sustainability: a suggested framework for sustainable ecotourism. *Environmental Science and Pollution Research*, 30(3), 5917-5930. <https://doi.org/10.1007/s11356-022-22496-w>
- Basile, V. (2021). The triple layered business model canvas in smart agriculture: the case of Evja startup. *Piccola Impresa/Small Business*(2). <https://doi.org/10.14596/pisb.2844>

- Benitez-Capistros, F., Hugé, J., & Koedam, N. (2014). Environmental impacts on the Galapagos Islands: Identification of interactions, perceptions and steps ahead. *Ecological Indicators*, 38, 113-123. <https://doi.org/10.1016/j.ecolind.2013.10.019>
- Bizzarri, C., & Micera, R. (2024). Regenerative tourism: New perspectives for Italian inland areas. In *Managing Natural and Cultural Heritage for a Durable Tourism* (pp. 189-201). Springer. https://doi.org/10.1007/978-3-031-52041-9_14
- Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production*, 65, 42-56. <https://doi.org/10.1016/j.jclepro.2013.11.039>
- Cha, S. S., & Kim, C. Y. (2026). Innovation in Gastronomic Tourism: Impact of Robotic Services on Sustainable Customer Experiences. *International Journal of Tourism Research*, 28(1), e70193. <https://doi.org/10.1002/jtr.70193>
- Chen, H.-S., Liu, W.-Y., & Hsieh, C.-M. (2017). Integrating ecosystem services and eco-security to assess sustainable development in Liuqiu Island. *Sustainability*, 9(6), 1002. <https://doi.org/10.3390/su9061002>
- Chen, J., Guan, J., Xu, J., & Clergeau, C. (2018). Constructing the green supply chain for rural tourism in China: Perspective of front-back stage decoupling. *Sustainability*, 10(11), 4276. <https://doi.org/10.3390/su10114276>
- Chen, L. H., Hung, P., & Ma, H. w. (2020). Integrating circular business models and development tools in the circular economy transition process: A firm-level framework. *Business Strategy and the Environment*, 29(5), 1887-1898. <https://doi.org/10.1002/bse.2477>
- Chiwaridzo, O. T., & Chiwaridzo, S. (2024). From crisis to prosperity: Leveraging robots, artificial intelligence, and service automation for sustainable tourism in Zimbabwe. *Business Strategy & Development*, 7(2), e380. <https://doi.org/10.1002/bsd2.380>
- Cook, D., Malinauskaite, L., & Davíðsdóttir, B. (2022). Peering into the fire—An exploration of volcanic ecosystem services. *Ecosystem Services*, 55, 101435. <https://doi.org/10.1016/j.ecoser.2022.101435>
- Cossengue, P. R., Brea, J. F., & Tavares, F. O. (2025). The transformative power of ecotourism: A comprehensive review of its economic, social, and environmental impacts. *Land*, 14(8), 1531. <https://doi.org/10.3390/land14081531>
- Costa, J., Rodrigues, D., & Gomes, J. (2019). Sustainability of tourism destinations and the importance of certification. *Worldwide Hospitality and Tourism Themes*, 11(6), 677-684. <https://doi.org/10.1108/WHATT-09-2019-0058>
- de-Miguel-Molina, B., de-Miguel-Molina, M., & Rumiche-Sosa, M. E. (2014). Luxury sustainable tourism in small island developing states surrounded by coral reefs. *Ocean & Coastal Management*, 98, 86-94. <https://doi.org/10.1016/j.ocecoaman.2014.05.021>
- Díaz-Castillo, G., Pacheco-Pumaleque, L., Pariona-Luque, R., Vegas-Gallo, E., Castanho, R., Donayre, J., Peñaranda, C., Shack-Yalta, N., Marin, W., & Quispe-Calderon, J. (2025). Optimisation of digital channels in tourism and their contribution to sustainable regional development through online travel agencies. *Discover Sustainability*, 6(1), 1310. <https://doi.org/10.1007/s43621-025-02171-z>
- Evans, S., Vladimirova, D., Holgado, M., Van Fossen, K., Yang, M., Silva, E. A., & Barlow, C. Y. (2017). Business model innovation for sustainability: Towards a unified perspective for creation of sustainable business models. *Business Strategy and the Environment*, 26(5), 597-608. <https://doi.org/10.1002/bse.1939>
- Farrukh, B., Younis, I., & Longsheng, C. (2023). The impact of natural resource management, innovation, and tourism development on environmental sustainability in low-income countries. *Resources Policy*, 86, 104088. <https://doi.org/10.1016/j.resourpol.2023.104088>
- García-Muiña, F. E., Medina-Salgado, M. S., Ferrari, A. M., & Cucchi, M. (2020). Sustainability transition in Industry 4.0 and smart manufacturing with the triple-layered business model canvas. *Sustainability*, 12(6), 2364. <https://doi.org/10.3390/su12062364>
- Hosseinzadeh-Bandbafha, H., Nizami, A.-S., Kalogirou, S. A., Gupta, V. K., Park, Y.-K., Fallahi, A., Sulaiman, A., Ranjbari, M., Rahnama, H., & Aghbashlo, M. (2022). Environmental life cycle assessment of biodiesel production

- from waste cooking oil: A systematic review. *Renewable and Sustainable Energy Reviews*, 161, 112411. <https://doi.org/10.1016/j.rser.2022.112411>
- Hurriyati, R., Dagustani, D., Surachim, A., Sulastri, S., & Lisnawati, L. (2023). Triple-layered business model canvas environment based in the fashion industry. *Journal of Human, Earth, and Future*, 4(4), 411-423. <http://dx.doi.org/10.28991/HEF-2023-04-04-03>
- Islam, Y., Mindia, P. M., Farzana, N., & Qamruzzaman, M. (2023). Nexus between environmental sustainability, good governance, financial inclusion, and tourism development in Bangladesh: Evidence from symmetric and asymmetric investigation. *Frontiers in Environmental Science*, 10, 1056268. <https://doi.org/10.3389/fenvs.2022.1056268>
- Ivanov, S., Duglio, S., & Beltramo, R. (2023). Robots in tourism and sustainable development goals: tourism agenda 2030 perspective article. *Tourism Review*, 78(2), 352-360. <https://doi.org/10.1108/TR-05-2022-0213>
- Ivasciuc, I.-S., Candrea, A. N., & Ispas, A. (2025). Exploring tourism experiences: The vision of Generation Z versus artificial intelligence. *Administrative Sciences*, 15(5), 186. <https://doi.org/10.3390/admsci15050186>
- Jindal, P. (2025). Economic, social, and environmental aspects of sustainable development-direct and indirect effects on business practices. In *Greening our economy for a sustainable future* (pp. 227-240). Elsevier. <https://doi.org/10.1016/B978-0-443-23603-7.00018-2>
- Joyce, A., & Paquin, R. L. (2016). The triple layered business model canvas: A tool to design more sustainable business models. *Journal of Cleaner Production*, 135, 1474-1486. <https://doi.org/10.1016/j.jclepro.2016.06.067>
- Kaewmorakot, P., Pianroj, N., & Chaiyakot, P. (2024). Exploring responsible tourism management in tour operators. Songklanakarin *Journal of Science & Technology*, 46(5). https://openurl.ebsco.com/viewer?sid=ebsco%3Aplink%3Acrawler-gcd&id=ebsco%3Aged%3A180915397&crl=c&jrnl=01253395&link_origin=scholar.google.com
- Kanwal, N., Meng, C. S., Watabe, M., Zainal, N., & Siew, J. K. K. (2024). Carbon footprint of tourism activities including transportation, accommodation, and infrastructure: a critical analysis. <https://doi.org/10.1108/978-1-83608-668-020241015>
- Khan, A., Bibi, S., Li, H., & Mu, D. (2025). Tourism sector decarbonisation and policy effectiveness in China: a subsectoral environmental performance analysis. *Frontiers in Environmental Science*, 13, 1649949. <https://doi.org/10.3389/fenvs.2025.1649949>
- Khezri, M., Mamghaderi, M., Razzaghi, S., & Heshmati, A. (2023). Comprehensive environmental assessment index of ecological footprint. *Environmental Management*, 71(2), 465-482. <https://doi.org/10.1007/s00267-022-01747-z>
- Khuong, M. N., Minh Phuong, N. T., & Hoang Phuong, T. N. (2025). Green Innovation Practices and Guests' Return Intention: Mediating Roles of Green Image, Guest's Positive Mood and Satisfaction. *SAGE Open*, 15(2), 21582440251335835. <https://doi.org/10.1177/21582440251335835>
- Kyriazopoulos, A., Skre, O., Sarkki, S., Wielgolaski, F., Abraham, E., & Ficko, A. (2017). Human-environment dynamics in European treeline ecosystems: a synthesis based on the DPSIR framework. *Climate Research*, 73, 17-29. <https://doi.org/10.3354/cr01454>
- Landon, A. C., Woosnam, K. M., & Boley, B. B. (2018). Modelling the psychological antecedents to tourists' pro-sustainable behaviours: An application of the value-belief-norm model. *Journal of sustainable tourism*, 26(6), 957-972. <https://doi.org/10.1080/09669582.2017.1423320>
- Lewandowski, M. (2016). Designing the business models for circular economy—Towards the conceptual framework. *Sustainability*, 8(1), 43. <https://doi.org/10.3390/su8010043>
- Li, B., Wu, C., & Wu, Z. (2009). The development roadmap analysis on China's Forest Parks. *Acta Ecologica Sinica*, 29(5), 2749-2756.
- Lim, T.-Y., Lim, B., Leong, C.-M., & Le, A. (2021). Finish your plate! Food disposition behaviour among late adolescents. *British Food Journal*, 123(9), 3192-3207. <https://doi.org/10.1108/BFJ-03-2021-0329>

- Liu, B., Moyle, B., Kralj, A., & Leung, D. (2025). Inspiration and pro-environmental behaviour in virtual nature-based tourism. *Journal of Sustainable Tourism*, 1-30. <https://doi.org/10.1080/09669582.2025.2561010>
- Liutikas, D. (2023). Post-COVID-19 tourism: Transformations of travelling experience. In COVID-19, Tourist Destinations and Prospects for Recovery: Volume One: A Global Perspective (pp. 277-301). Springer. <https://doi.org/10.1007/978-3-031-22257-3>
- Lukoseviciute, G., & Panagopoulos, T. (2021). Management priorities from tourists' perspectives and beach quality assessment as tools to support sustainable coastal tourism. *Ocean & Coastal Management*, 208, 105646. <https://doi.org/10.1016/j.ocecoaman.2021.105646>
- Luković, M., Kostić, M., Dudić, B., Spalević, V., & Pantović, D. (2024). Perceptions of mountain ecosystem services in Golija-Studenica Biosphere Reserve, Serbia: latent transformation from sustainable towards regenerative tourism. *Journal on Protected Mountain Areas Research and Management*, 16, 4-15. <https://doi.org/10.1553/eco.mont-16-2s4>
- Mariño-Romero, J. M., Campón-Cerro, A. M., Hernández-Mogollón, J. M., & Folgado-Fernández, J. A. (2017). The relationship between revenue and environmental responsibility: A causal study using reputation in the hotel industry. In Sustainability in Innovation and Entrepreneurship: Policies and Practices for a World with Finite Resources (pp. 119-136). Springer. <https://doi.org/10.1007/978-3-319-57318-2>
- Martínez, P., Herrero, Á., & Gómez-López, R. (2019). Corporate images and customer behavioural intentions in an environmentally certified context: Promoting environmental sustainability in the hospitality industry. *Corporate Social Responsibility and Environmental Management*, 26(6), 1382-1391. <https://doi.org/10.1002/csr.1754>
- Matias, T. P., Leonel, J., & Imperador, A. M. (2022). A systemic environmental impact assessment on tourism in island and coastal ecosystems. *Environmental Development*, 44, 100765. <https://doi.org/10.1016/j.envdev.2022.100765>
- Mili, S., & Loukil, T. (2023). Enhancing sustainability with the triple-layered business model canvas: Insights from the fruit and vegetable industry in Spain. *Sustainability*, 15(8), 6501. <https://doi.org/10.3390/su15086501>
- Miller-Rushing, A. J., Primack, R. B., Ma, K., & Zhou, Z.-Q. (2017). A Chinese approach to protected areas: A case study comparison with the United States. *Biological Conservation*, 210, 101-112. <https://doi.org/10.1016/j.biocon.2016.05.022>
- Morioka, S. N., Bolis, I., Evans, S., & Carvalho, M. M. (2017). Transforming sustainability challenges into competitive advantage: Multiple case studies kaleidoscope converging into sustainable business models. *Journal of Cleaner Production*, 167, 723-738. <https://doi.org/10.1016/j.jclepro.2017.08.118>
- Muñoz Barriga, A. (2017). Tourism management perceptions in two ecuadorian biosphere reserves: *Galapagos and Sumaco*. *Investigaciones geográficas*, (93), 0-0. <https://doi.org/10.14350/ig.47805>
- Nguyen, M. D., To, X. B., & Le, H. A. (2023). Integration of Mobile and Web GIS Technologies to Promote Smart and Sustainable Tourism in Vietnam. *Inżynieria Mineralna*.
- Nosratabadi, S., Mosavi, A., Shamshirband, S., Zavadskas, E. K., Rakotonirainy, A., & Chau, K. W. (2019). Sustainable business models: A review. *Sustainability*, 11(6), 1663. <https://doi.org/10.3390/su11061663>
- Onifade, S. T., & Haouas, I. (2023). Assessing environmental sustainability in top Middle East travel destinations: insights on the multifaceted roles of air transport amidst other energy indicators. *Environmental Science and Pollution Research*, 30(45), 101911-101926. <https://doi.org/10.1007/s11356-023-29183-4>
- Osterwalder, A., & Pigneur, Y. (2013). *Business model generation: a handbook for visionaries, game changers, and challengers*. John Wiley & Sons.
- Oviedo-García, M. Á., Vega-Vázquez, M., Castellanos-Verdugo, M., & Orgaz-Agüera, F. (2019). Tourism in protected areas and the impact of servicescape on tourist satisfaction, key in sustainability. *Journal of Destination Marketing & Management*, 12, 74-83. <https://doi.org/10.1016/j.jdmm.2019.02.005>
- Paul, J., Lim, W. M., O'Cass, A., Hao, A. W., & Bresciani, S. (2021). Scientific procedures and rationales for systematic literature reviews (SPAR-4-SLR). *International journal of consumer studies*, 45(4), O1-O16. <https://doi.org/10.1111/ijcs.12695>

- Pieroni, M. P., McAloone, T. C., & Pigosso, D. C. (2019). Business model innovation for circular economy and sustainability: A review of approaches. *Journal of Cleaner Production*, 215, 198-216. <https://doi.org/10.1016/j.jclepro.2019.01.036>
- Pongsuppat, U., Jantararat, P., Kamhangwong, D., & Wicha, S. (2023). Enhancing local tourism sustainability through a digital local tourism management system (DLTMS). 2023 Joint International Conference on Digital Arts, Media and Technology with ECTI Northern Section Conference on Electrical, Electronics, Computer and Telecommunications Engineering (ECTI DAMT & NCON) <https://doi.org/10.1109/ECTIDAMTNCN57770.2023.10139694>
- Pop, A.-M., Marian-Potra, A.-C., Hognogi, G.-G., & Puiu, V. (2024). Glamping tourism as a sustainable response to the need to reinvigorate domestic tourism. *Journal of Destination Marketing & Management*, 31, 100803. <https://doi.org/10.1016/j.jdmm.2023.100803>
- Preziosi, M., Acampora, A., Lucchetti, M. C., & Merli, R. (2022). Delighting hotel guests with sustainability: Revamping importance-performance analysis in the light of the three-factor theory of customer satisfaction. *Sustainability*, 14(6), 3575. <https://doi.org/10.3390/su14063575>
- Primavera, J. H. (2006). Overcoming the impacts of aquaculture on the coastal zone. *Ocean & Coastal Management*, 49(9-10), 531-545. <https://doi.org/10.1016/j.ocecoaman.2006.06.018>
- Pulido-Fernández, J. I., Cárdenas-García, P. J., & Espinosa-Pulido, J. A. (2019). Does environmental sustainability contribute to tourism growth? An analysis at the country level. *Journal of Cleaner Production*, 213, 309-319. <https://doi.org/10.1016/j.jclepro.2018.12.151>
- Raggi, A., & Petti, L. (2006). A newly developed integrated environment-quality approach for the design of hotel services. *Progress in Industrial Ecology, An International Journal*, 3(3), 251-271. <https://doi.org/10.1504/PIE.2006.011132>
- Rauter, R., Jonker, J., & Baumgartner, R. J. (2017). Going one's own way: drivers in developing business models for sustainability. *Journal of Cleaner Production*, 140, 144-154. <https://doi.org/10.1016/j.jclepro.2015.04.104>
- Reinhold, S., Zach, F. J., & Krizaj, D. (2017). Business models in tourism: a review and research agenda. *Tourism Review*, 72(4), 462-482. <https://doi.org/10.1108/TR-05-2017-0094>
- Riensche, M., Castillo, A., Flores-Díaz, A., & Maass, M. (2015). Tourism at Costalegre, Mexico: An ecosystem services-based exploration of current challenges and alternative futures. *Futures*, 66, 70-84. <https://doi.org/10.1016/j.futures.2014.12.012>
- Rosenblum, J., Horvath, A., & Hendrickson, C. (2000). Environmental implications of service industries. In: ACS Publications. <https://doi.org/10.1021/es9914083>
- Schaltegger, S., Lüdeke-Freund, F., & Hansen, E. G. (2016). Business models for sustainability: A co-evolutionary analysis of sustainable entrepreneurship, innovation, and transformation. *Organisation & Environment*, 29(3), 264-289. <https://doi.org/10.1177/1086026616633272>
- Scott, D. J., Lemieux, C. J., & Malone, L. (2011). Climate services to support sustainable tourism and adaptation to climate change. *Climate Research*, 47, 111-122. <https://doi.org/10.3354/cr00952>
- Singh, K. (2021). Does your post-COVID-19 travel dream talk about sustainability? Insights from potential tourists in India. <https://doi.org/10.1108/978-1-80071-511-020211019>
- Skarakis, N., Skinitis, G., Tournaki, S., & Tsoutsos, T. (2023). Necessity to assess the sustainability of sensitive ecosystems: A comprehensive review of tourism pressures and the travel cost method. *Sustainability*, 15(15), 12064. <https://doi.org/10.3390/su151512064>
- Stoeckl, N., Hicks, C. C., Mills, M., Fabricius, K., Esparon, M., Kroon, F., Kaur, K., & Costanza, R. (2011). The economic value of ecosystem services in the Great Barrier Reef: our state of knowledge. *Annals of the New York Academy of Sciences*, 1219(1), 113-133. <https://doi.org/10.1111/j.1749-6632.2010.05892.x>
- Stone, M., & Smith, D. (2006). An outline of Parks Victoria's Tourism Partnerships Strategy and challenges for sustainable park tourism in Australia. *WIT Transactions on Ecology and the Environment*, 97.

- Stubbs, W., & Cocklin, C. (2008). Conceptualising a “sustainability business model”. *Organisation & Environment*, 21(2), 103-127. <https://doi.org/10.1177/1086026608318042>
- Todeschini, B. V., Cortimiglia, M. N., Callegaro-de-Menezes, D., & Ghezzi, A. (2017). Innovative and sustainable business models in the fashion industry: Entrepreneurial drivers, opportunities, and challenges. *Business Horizons*, 60(6), 759-770. <https://doi.org/10.1016/j.bushor.2017.07.003>
- Tomassini, L., & Cavagnaro, E. (2022). Circular economy, circular regenerative processes, a growth and placemaking for tourism future. *Journal of Tourism Futures*, 8(3), 342-345. <https://doi.org/10.1108/JTF-01-2022-0004>
- Turner, D., Ting, H., Wong, M. W., Lim, T.-Y., & Tan, K.-L. (2021). Applying qualitative approach in business research. *Asian Journal of Business Research*, 11(3), 1-13. <https://doi.org/10.14707/ajbr.210111>
- White, D. D. (2007). An interpretive study of Yosemite National Park visitors’ perspectives towards alternative transportation in Yosemite Valley. *Environmental Management*, 39(1), 50-62. <https://doi.org/10.1007/s00267-006-0061-9>
- Wuddivira, M. N., De Caires, S. A., Joseph, J., Atwell, M. A., & Lewis-Cameron, A. (2023). An influencer pathway framework for sustainable tourism in SIDS ecotourism hotspots: A case of Aripo ecosystems, Trinidad. *Frontiers in Sustainable Tourism*, 2, 1117006. <https://doi.org/10.3389/frsut.2023.1117006>
- Xia, B., Dong, S., Li, Z., Zhao, M., Sun, D., Zhang, W., & Li, Y. (2022). Eco-efficiency and its drivers in tourism sectors with respect to carbon emissions from the supply chain: An integrated EEIO and DEA approach. *International Journal of Environmental Research and Public Health*, 19(11), 6951. <https://doi.org/10.3390/ijerph19116951>
- Yaling, Z., Rehman, A. U., Nawal, A., Ullah, I., & Puwanendram, G. (2025). Exploring the impact of ecotourism experiences and social media engagement on value co-creation. *Cogent Social Sciences*, 11(1), 2537809. <https://doi.org/10.1080/23311886.2025.2537809>
- Yusoff, F., Shariff, M., & Gopinath, N. (2006). Diversity of Malaysian aquatic ecosystems and resources. *Aquatic Ecosystem Health & Management*, 9(2), 119-135. <https://doi.org/10.1080/14634980600713315>
- Zabala, J. A., Martínez-Paz, J. M., & Alcon, F. (2021). A comprehensive approach for agroecosystem services and disservices valuation. *Science of the Total Environment*, 768, 144859. <https://doi.org/10.1016/j.scitotenv.2020.144859>
- Zekri, S., Mbagha, M., Fouzai, A., & Al-Shaqsi, S. (2011). Recreational value of an oasis in Oman. *Environmental Management*, 48(1), 81-88. <https://doi.org/10.1007/s00267-011-9678-4>
- Zhang, J.-T., Xiang, C., & Li, M. (2012). Effects of tourism and topography on vegetation diversity in the subalpine meadows of the Dongling Mountains of Beijing, China. *Environmental Management*, 49(2), 403-411. <https://doi.org/10.1007/s00267-011-9786-1>
- Zhang, Y., Liu, J., Zhang, J., & Wang, R. (2013). Energy-based evaluation of system sustainability and ecosystem value of a large-scale constructed wetland in North China. *Environmental monitoring and assessment*, 185(7), 5595-5609. <https://doi.org/10.1007/s10661-012-2970-9>



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