Cogent Social Sciences

ISSN: 2331-1886 (Online) Journal homepage: www.tandfonline.com/journals/oass20

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To cite this article: Muhammad Fikry Aransyah, Bambang Hermanto, Anang Muftiadi & Hera Oktadiana (2025) Exploring sustainability oriented innovations in tourism: insights from ecological modernization, diffusion of innovations, and the triple bottom line, Cogent Social Sciences, 11:1, 2447396, DOI: 10.1080/23311886.2024.2447396

To link to this article: https://doi.org/10.1080/23311886.2024.2447396

Published online: 07 Jan 2025.

COGENT SOCIAL SCIENCES
2025, VOL. 11, NO. 1, 2447396
https://doi.org/10.1080/23311886.2024.2447396

LEISURE & TOURISM | RESEARCH ARTICLE

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Exploring sustainability oriented innovations in tourism: insights from ecological modernization, diffusion of innovations, and the triple bottom line

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ABSTRACT

Sustainability-oriented innovations (SOIs) are reshaping the tourism industry by addressing environmental, economic, and social challenges. This study synthesises existing research on the impacts of SOIs in tourism through a bibliometric analysis of 88 studies from Scopus. Using Ecological Modernisation Theory (EMT), Diffusion of Innovations (DoI) Theory, and Triple Bottom Line (TBL) Theory, the research highlights the contribution of SOIs to sustainable tourism development. The findings indicate that SOIs enhance environmental sustainability by promoting resource conservation and pollution reduction via green technologies. Economically, SOIs improve financial performance, operational efficiency, and competitiveness while generating revenue through green certifications and eco-labels. Socially, they foster community involvement, customer satisfaction, and social equity. Quantitative methods, such as surveys and regression analysis, are predominant in existing research, complemented by qualitative and mixed-method approaches. This study also identifies critical gaps in the literature, including the long-term impacts of SOIs, the role of technology and green finance, and the effectiveness of green certifications. Addressing these gaps could guide policymakers, tourism practitioners, and stakeholders in advancing sustainable practices and policies. The findings underscore the potential of SOIs to drive sustainable development in tourism and offer valuable insights for future research directions.

ARTICLE HISTORY
Received 12 August 2024
Revised 8 November 2024
Accepted 20 December 2024

KEYWORDS
Sustainability-oriented innovations; sustainable tourism practices; bibliometric analysis; tourism industry; environmental sustainability

SUBJECTS
Tourism; Tourism and the Environment; Tourism Development/Impacts; The Tourism Industry

Introduction

Tourism, while significantly contributing to economic development, cultural exchange, and employment, also leads to environmental degradation, social inequalities, and economic disparities (Anser et al., 2021). In response to these challenges, Sustainability-Oriented Innovations (SOIs) have emerged as a crucial pathway for promoting sustainable tourism development. SOIs encompass the adoption of green technologies, eco-friendly practices, and sustainable business models that aim to mitigate negative environmental impacts and foster economic and social well-being (Costa et al., 2020; Gürlek & Koseoglu, 2021).

Ecological Modernization Theory (EMT) provides a comprehensive framework for understanding the interplay between technological advancements, policy initiatives, and environmental sustainability within economic and institutional contexts. This theory posits that environmental improvements can be achieved through the integration of ecological considerations into the fabric of economic activities and governance structures, thereby facilitating a transition towards sustainable practices (Mol & Spaargaren, 2000). In the tourism sector, EMT underscores the potential for tourism businesses and policymakers to adopt innovative strategies that align with sustainability goals. For instance, the integration of sustainability

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principles into national tourism policies, as evidenced in Indonesia's Law Number 10 Year 2009, reflects a growing recognition of the multidimensional aspects of sustainable tourism, which encompass environmental, economic, and socio-cultural dimensions (Nurjaya, 2022).

Moreover, the application of EMT in tourism highlights the necessity for inclusive stakeholder engagement in policy formulation and implementation. Research indicates that sustainable tourism development is contingent upon the active participation of various stakeholders, including local communities, government entities, and the private sector (Dalei et al., 2021; Scheyvens, 2011; Yasarata et al., 2010). This participatory approach not only enhances the legitimacy of tourism policies but also ensures that diverse perspectives are considered, thereby fostering a more holistic understanding of sustainability challenges and opportunities within the tourism landscape. The complexities of sustainable tourism governance necessitate a shift from traditional top-down approaches to more collaborative frameworks that recognize the interconnectedness of political, social, and environmental factors (Guo et al., 2019).

Diffusion of Innovations (DoI) Theory examines the processes by which innovations are adopted and spread within a social system, highlighting critical factors such as perceived benefits, compatibility with existing practices, and the effectiveness of communication channels (Dibra, 2015; Gallo et al., 2021). In the context of tourism, DoI Theory provides valuable insights into how sustainable practices and technologies are disseminated among businesses, ultimately influencing industry standards and consumer behavior. For instance, the adoption of eco-friendly technologies in tourism can be significantly impacted by the perceived relative advantage of these innovations over traditional practices, as well as their compatibility with the operational frameworks of tourism enterprises (Singjai et al., 2018).

Moreover, the role of communication channels in the diffusion process cannot be overstated. Effective dissemination of information regarding sustainable innovations often relies on strong networks among stakeholders, including tourism operators, government agencies, and local communities (Gomes, 2024). These networks facilitate the sharing of knowledge and experiences, which can enhance the visibility and perceived value of sustainable practices. For example, the use of social media as a promotional tool has been shown to accelerate the adoption of innovative practices in tourism by providing platforms for sharing success stories and best practices among industry players (Shahzad et al., 2024). This aligns with the findings of Kumar et al. (2024), who highlight the importance of digital transformation in shaping the future of tourism through the adoption of sustainable practices.

Triple Bottom Line (TBL) Theory emphasizes the necessity of balancing economic prosperity, environmental quality, and social equity, providing a holistic framework for evaluating the comprehensive impacts of SOIs on tourism businesses and destinations. Elkington's original formulation of TBL highlights that sustainable development must consider not only financial performance but also the ecological and social dimensions, thereby encouraging businesses to adopt practices that contribute positively to all three areas (Alhaddi, 2015). In the context of tourism, the application of TBL can facilitate stakeholder collaboration, which is essential for sustainable ecotourism development. Research indicates that effective stakeholder engagement can enhance the alignment of interests across various groups, ensuring that tourism development is economically viable, environmentally sustainable, and socially equitable (Sentanu et al., 2021; Wondirad et al., 2020).

Furthermore, the TBL framework allows for a nuanced evaluation of tourism's impacts on local communities. Studies have shown that residents' perceptions of tourism development are closely linked to the TBL dimensions, as they assess the economic benefits, environmental impacts, and social changes brought about by tourism activities (Wambura et al., 2022). For example, Stylidis et al. highlight that residents' support for tourism development is influenced by their evaluations of its economic, environmental, and socio-cultural impacts, which aligns with the TBL approach (Stylidis et al., 2014). This underscores the importance of incorporating local perspectives into tourism planning to ensure that developments are not only profitable but also beneficial to the community and the environment. Moreover, innovations such as green technologies and eco-friendly practices have shown to reduce resource consumption and environmental pollution, promoting sustainable industrial development in the hospitality and tourism sector (Sun et al., 2022).

Despite the growing body of research on SOIs in tourism, existing studies often focus on specific aspects or dimensions of sustainability, lacking a holistic approach that integrates multiple theoretical perspectives. Many studies apply singular theoretical frameworks or analyze isolated cases, which limits the understanding of the interconnected impacts of SOIs on environmental, economic, and social dimensions. Moreover, there is a lack of comprehensive bibliometric analyses that synthesize existing knowledge to identify trends, themes, and gaps within the literature.

The bibliometric analysis reveals that previous studies have independently applied EMT, DoI, and TBL theories to various aspects of sustainable tourism (Mol & Spaargaren, 2000). For instance, water-saving innovations in hotels and the implementation of renewable energy technologies in heritage buildings have shown substantial environmental benefits (Razumova et al., 2016). Studies have shown that green marketing strategies and the adoption of green innovations in tourism businesses enhance customer satisfaction and loyalty, ultimately driving economic performance (Cheng et al., 2022; Garay et al., 2019). However, there is a scarcity of research on the role of technology, business-to-business interactions, and green finance in promoting sustainable tourism (Sun et al., 2022).

Despite the growing body of research on SOIs in tourism, existing studies often focus on specific aspects or dimensions of sustainability, lacking a holistic approach that integrates multiple theoretical perspectives. Many studies apply singular theoretical frameworks or analyze isolated cases, which limits the understanding of the interconnected impacts of SOIs on environmental, economic, and social dimensions. Moreover, there is a lack of comprehensive bibliometric analyses that synthesize existing knowledge to identify trends, themes, and gaps within the literature.

While the triple bottom line framework has been extensively applied in the tourism sector to evaluate sustainable practices, there remains a lack of comprehensive studies that integrate multiple theoretical perspectives to provide a holistic understanding of SOIs. Existing literature primarily focuses on individual dimensions of sustainability, often neglecting the interconnectedness of environmental, economic, and social impacts (Lesar & Weaver, 2021). For example, studies on green certifications and eco-labels highlight their importance in differentiating businesses in competitive markets but do not thoroughly examine their long-term economic and social impacts (Melane-Lavado et al., 2018).

Furthermore, the majority of research on SOIs in tourism has been activity-specific or region-specific, with limited comparative and longitudinal studies across different regions and tourism types (Tao & Chen, 2016; Triantafillidou & Tsiaras, 2018). This fragmentation necessitates a more integrated approach to understanding how SOIs can simultaneously drive economic growth, environmental protection, and social equity in tourism.

This study provides a bibliometric analysis of the existing literature on the impacts of SOIs on tourism, integrating insights from EMT, DoI Theory, and TBL Theory to map key themes, research gaps, and trends across environmental, economic, and social dimensions. Therefore, the objectives of this study are:

1. To synthesize existing research on the environmental impacts of SOIs in tourism, particularly focusing on resource conservation, pollution reduction, and the promotion of environmental sustainability through the lens of EMT.
2. To evaluate the economic impacts of SOIs on tourism businesses, including financial performance, competitiveness, and economic benefits, utilizing insights from TBL Theory.
3. To analyze the social impacts of SOIs within tourism contexts, such as community involvement, customer satisfaction, social equity, and overall social well-being, informed by DoI Theory and TBL Theory.

This bibliometric analysis will map key themes, research gaps, and trends across the environmental, economic, and social dimensions of SOIs in tourism. By systematically reviewing and synthesizing the literature, the study aims to provide valuable insights for academics, practitioners, and policymakers on the role and effectiveness of SOIs in promoting sustainable tourism. The novelty of this study lies in its integrated theoretical framework and comprehensive bibliometric approach, which together offer a holistic understanding of SOIs in tourism. By bridging the gap between fragmented studies and theoretical applications, this research contributes to a coherent body of knowledge, facilitating better-informed decisions and strategies for sustainable tourism development.

Data and methodology

Our study aimed to conduct a bibliometric review of the literature on the impacts of Sustainability-Oriented Innovations (SOI) on tourism, integrating Ecological Modernization Theory (EMT), Diffusion of Innovations (DoI) Theory, and Triple Bottom Line (TBL) Theory into our analytical framework. This approach was designed to systematically capture the multifaceted effects of SOIs across environmental, economic, and social dimensions. Bibliometric analysis is a valuable method for quantitatively assessing the body of literature on a topic, allowing researchers to identify patterns, trends, and gaps in research (Donthu et al., 2021). This approach is particularly suitable for our study as it enables a systematic synthesis of existing knowledge on SOIs in tourism, providing insights that can guide future research and practice.

To conduct a thorough bibliometric review, we performed a systematic search using the Scopus database. The search strategy involved the use of specific search terms, including "sustainable innova*," "sustainability oriented innova*," "innova* sustainability," "green innova*," "environmental innova*," "eco* innova*," "green product innova*," and "green process innova*." This initial search yielded 8,673 documents up to 1 June 2024. To refine our results specifically for tourism, we added the term "touris*," which narrowed the results to 142 documents. Further refinement was carried out to include only articles, reducing the count to 99 documents.

The articles were further screened based on specific criteria: the focus on SOI within the context of tourism, articles providing empirical or theoretical findings related to the impacts of such innovations on tourism, subject areas including business management and accounting, environmental science, social science, energy, engineering, econometrics and finance, decision science, and multidisciplinary studies, and articles published in English. We acknowledge that limiting our selection to English-language articles may introduce language bias and potentially exclude relevant studies published in other languages. However, English is the predominant language in academic publishing, and including only English-language articles ensures consistency in our analysis (Zheng & Guo, 2019).

This rigorous refinement process resulted in 94 documents, and after applying the inclusion and exclusion criteria meticulously, 88 documents were selected for review. While the sample size of 88 articles may seem limited in the context of the initial 8,673 documents, it represents a focused and relevant collection of studies that specifically synthesize existing research SOIs in tourism within our defined criteria. This sample size is sufficient for a bibliometric analysis as it allows for a manageable yet comprehensive examination of the literature, ensuring the reliability of our conclusions (Zupic & Čater, 2015).

Data extraction involved systematically gathering information on study characteristics, methodologies, key findings, and outcomes, enabling a comprehensive synthesis of the existing research on SOI in tourism. We systematically sought data on environmental impacts, economic performance, and social outcomes associated with these innovations. To minimize potential biases and enhance the reliability of our findings, data extraction was conducted independently by multiple researchers, and discrepancies were resolved through discussion and consensus. Our study is based on the analysis of publicly available data from published articles, and no human participants were involved. Therefore, ethical approval was not required. We have no conflicts of interest to declare.

Our bibliometric analysis applies EMT, DoI Theory, and TBL Theory as lenses to identify patterns, gaps, and future research opportunities within the existing literature on SOIs in tourism. EMT highlights the role of technological innovations and policy measures in achieving sustainable tourism. DoI Theory examines how SOIs are adopted and spread within the tourism sector, focusing on factors such as perceived benefits and compatibility. TBL Theory emphasizes balancing economic, social, and environmental objectives in evaluating the impacts of SOIs. By integrating these theories, our analysis provides a multifaceted understanding of SOIs in tourism, contributing to the theoretical rigor and practical relevance of our study. By integrating these theories, our analysis provides a multifaceted understanding of SOIs in tourism, contributing to the theoretical rigor and practical relevance of our study. The selection process of the relevant studies is further illustrated in the PRISMA Flow Diagram (Figure 1), demonstrating a transparent and replicable search strategy.

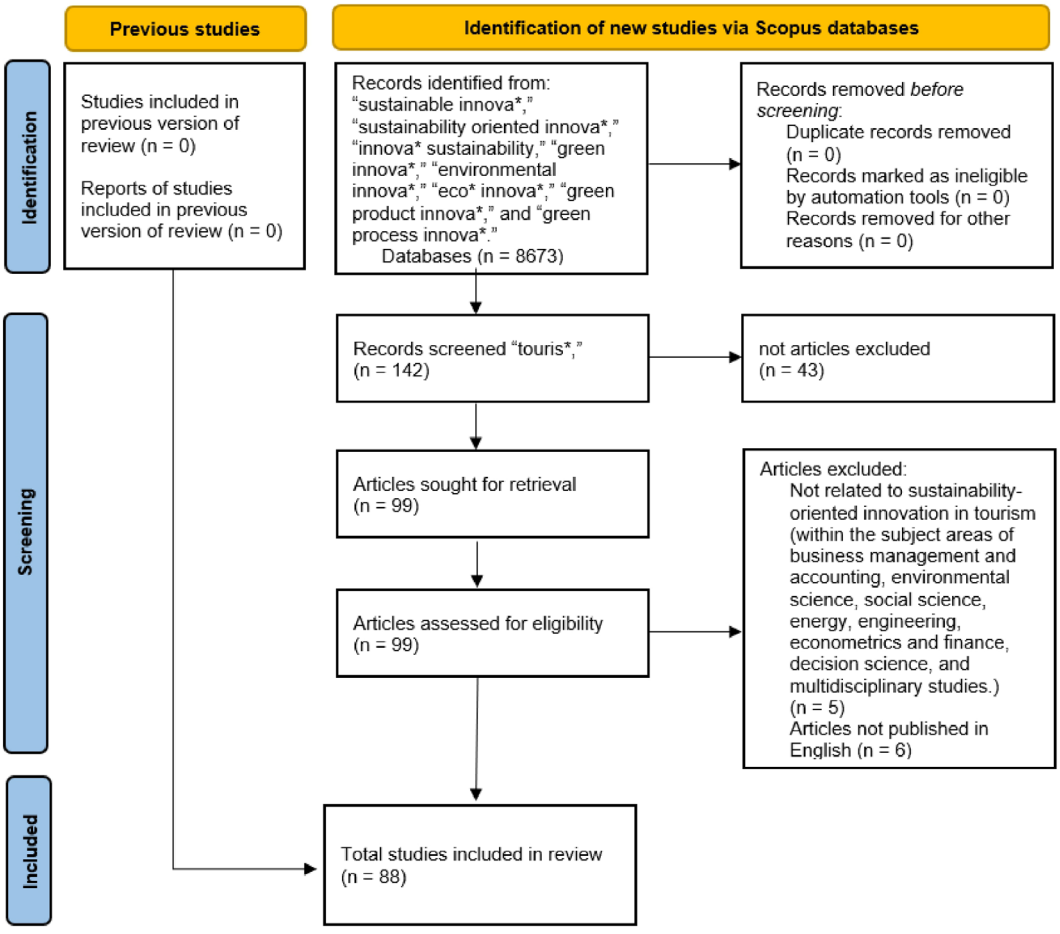

Figure 1. PRISMA flow diagram modified from Page et al. (2021).

Table 1. Number of publications on SOIs in tourism by impact category in five-yearly term (2005-2024).

Period	Environmental Impacts	Economic Impacts	Social Impacts
2005 - 2009	7	3	1
2010 - 2014	20	13	7
2015 - 2019	45	27	20
2020 - 2024*	88	53	38

*2024 article until 31 May 2024.

Results and discussion

The environmental, economic, and social nexus of SOI in tourism

Our bibliometric analysis of 88 publications on sustainability-oriented innovations (SOI) in tourism categorizes the literature into three main strands: environmental impacts, economic impacts, and social impacts (Table 1). Figure 2 illustrate the distribution of analyzed publications across the impact categories over time, based on our bibliometric review.

Before 2010, the number of articles in each category was relatively low and stable. For instance, between 2005 and 2009, there were 7 publications on environmental impacts, 3 on economic impacts, and 1 on social impacts. However, after 2010, there was a noticeable increase in publications, especially those focusing on environmental impacts, averaging more than six papers annually between 2010 and 2020. Specifically, from 2010 to 2014, environmental impact studies rose to 20, economic impacts to 13, and social impacts to 7. Economic impacts publications grew at a slower rate, averaging four yearly publications. Since 2015, there has been a steady increase in publications on social impacts, averaging

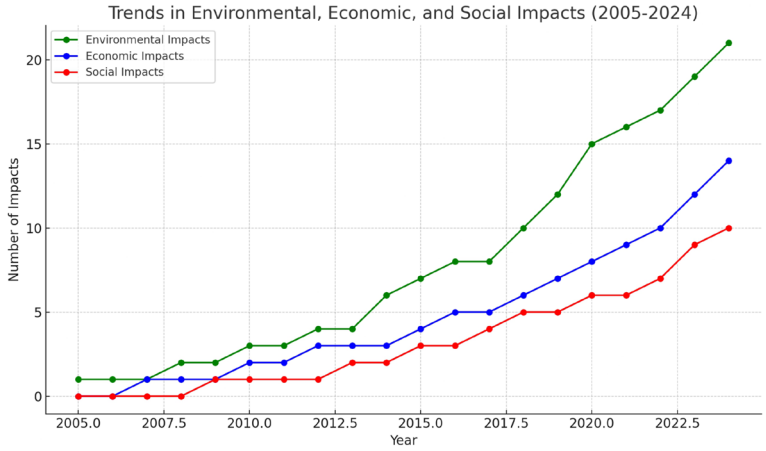

Figure 2. Trends in environmental, economic and social impacts (2005-2024).
Source: Developed by authors (2024).

five yearly publications. From 2015 to 2019, publications on environmental impacts reached 45, economic impacts 27, and social impacts 20. This trend indicates a growing recognition of the diverse impacts of SOIs in tourism. Our analysis reveals that environmental, economic, and social impacts are interconnected. For example, implementing green technologies (environmental impact) can lead to cost savings (economic impact) and enhance community well-being (social impact).

The analysis shows that SOIs are a major focus in the literature concerning environmental outcomes in tourism. Of the reviewed articles, 35 (40%) emphasize this aspect, exploring green technologies and eco-friendly practices aimed at conserving natural resources and reducing pollution. For instance, Razumova et al. (2016) examined water-saving innovations in hotels, demonstrating substantial environmental benefits. Cheng et al. (2022) investigated the influence of green marketing on customers' green behavioral intentions, highlighting the potential for behavioral change to enhance environmental sustainability in tourism. Meyer et al. (2022) discussed the role of cultural and creative industries in promoting sustainable and resilient tourism, emphasizing the need for innovative strategies to mitigate negative environmental impacts.

Our analysis indicates that 30 articles (34%) concentrate on economic impacts, examining themes such as the financial performance of tourism businesses adopting sustainable practices, the role of green innovations in enhancing competitiveness, and the economic benefits associated with sustainability. Garay et al. (2019) analyzed the economic advantages of sustainability-oriented practices using the Decomposed Theory of Planned Behavior. Sunarya et al. (2023) highlighted the significance of green supply chain management in improving the performance of small and medium-sized tourism enterprises.

The social impacts of SOIs are discussed in 23 articles (26%), analyzing outcomes such as community involvement, customer satisfaction, and social equity. Triantafillidou and Tsiaras (2018) examined sustainable tourism development in Greece, focusing on fostering local community engagement. Tao and Chen (2016) explored green innovation in China's tourism industry, highlighting social benefits in enhancing social equity and customer satisfaction. Sharma and Bhat (2023) examined the role of community involvement in sustainable tourism strategies, demonstrating positive impacts on social and environmental innovation.

Table 2 reveals significant international collaboration in research on SOIs in tourism. SCP (Single Country Publications) refers to the number of research articles published by researchers from a single country. MCP (Multiple Country Publications) refers to the number of research articles published by researchers from multiple countries. China leads with 21 articles, followed by Spain with 10 articles, and Italy with 5 articles. Other countries, including Australia, Indonesia, Portugal, and the USA, each contributed 2 articles. The distribution underscores the diverse international collaboration in the field.

The bibliometric analysis reveals that research methodologies in the reviewed studies are predominantly quantitative, accounting for 69.3%. Qualitative methods, including interviews and case studies, make up 22.7% of the research, while mixed methods constitute 8.0% (Table 3). These findings highlight

Table 2. The corresponding author's countries.

Country	Articles	SCP	MCP
China	21	15	6
Spain	10	8	2
Italy	5	4	1
Australia	2	2	0
Indonesia	2	2	0
Malta	2	0	2
Pakistan	2	0	2
Portugal	2	2	0
South Africa	2	2	0
Turkey	2	1	1
United Kingdom	2	2	*0*
USA	2	2	0

Source: Developed by authors (2024).

Table 3. Methodology used in the journal articles.

Methods	Frequency	Percentage	Remarks
Quantitative	61	69.3%	Mainly surveys, SEM, regression analysis
Qualitative	20	22.7%	Mainly interviews, case studies, content analysis
Mixed Methods	7	8.0%	Combination of qualitative and quantitative approaches

Source: Developed by authors (2024).

Table 4. Types of journals and journal titles based on Subject Category Tourism, Leisure and Hospitality Management.

Journal types and titles	Total
Tourism, Leisure and Hospitality Management journals	41 (47%)
Journal of Sustainable Tourism	6
Annals of Tourism Research	3
Journal of Hospitality and Tourism Research	3
Tourism Economics	3
Tourism Management	3
Others	23
Non-Tourism, Leisure and Hospitality Management journals	47 (53%)
Sustainability (Switzerland)	11
Journal of Cleaner Production	4
Environmental Science and Pollution Research	2
Journal of Environmental Planning and Management	2
Sustainable Development	2
Others	26

Source: Developed by authors (2024).

extensive global collaboration and a preference for quantitative research methods in the study of SOIs in tourism.

Publications are split between tourism-specific and broader academic journals. Nearly half (47%) are in Tourism, Leisure, and Hospitality Management journals, with the Journal of Sustainable Tourism being the most frequent. Other key journals include Annals of Tourism Research and Journal of Hospitality and Tourism Research. The remaining 53% are published in non-tourism journals, notably Sustainability (Switzerland), Journal of Cleaner Production, and Environmental Science and Pollution Research (Table 4). The distribution of publications underscores the interdisciplinary interest in sustainable tourism practices.

Environmental impacts of SOI on tourism

The reviewed literature indicates that SOIs in tourism have a significant impact on the environment, primarily through resource conservation and pollution reduction. The reviewed studies emphasize the positive effects of integrating green technologies and eco-friendly practices, which are commonly cited as key strategies in the literature. Razumova et al. (2016), as reviewed in the literature, highlight successful examples of climate change mitigation strategies in heritage buildings in the UK and water-saving innovations in Majorcan hotels.

Similarly, Cheng et al. (2022) and Meyer et al. (2022) emphasize that green marketing, the role of cultural and creative industries, and environmental education in tourism enhance environmental

awareness and encourage sustainable behaviors among tourists, promoting resilient tourism. Moreover, Qin et al. (2024), Gu (2023) and Qu et al. (2022) discuss the adoption of green innovations in event management and the enhancement of green innovation in China's tourism industry through green core competencies, institutional pressures, organizational learning, and green organizational culture. Warren and Becken (2017) further elaborate on energy and water-saving innovations, proposing a framework to advance resource-saving technologies in tourism accommodations.

The analysis of existing research shows that energy-efficient buildings and renewable energy installations are increasingly highlighted as prevalent in tourism. These technologies not only reduce carbon footprints but also set a sustainable development precedent. Elzek et al. (2021) and Jacob et al. (2010) emphasize that green technologies and environmental innovations drive sustainable tourism by satisfying environmental, social, and economic needs, preserving natural habitats, and reducing waste. As identified in the literature, further studies by Zhao et al. (2022), Razzaq et al. (2023), and Ji et al. (2023) explore the impact of inbound tourism on regional ecological efficiency. Hashmi et al. (2023) investigate the influence of top management team diversity and the presence of a chief sustainability officer on green innovation in the tourism sector.

Studies by Sun et al. (2022) and Fernández-Torres et al. (2021) highlight the efficiency of green innovation, showing how eco-friendly practices improve overall environmental performance and maintain ecological balance, with gender-diverse boards enhancing environmental innovation in tourism. Liu et al. (2023) and Işik (2024) examine how tourism industrial agglomeration impacts green innovation efficiency, finding a threshold effect, and that green innovation and effective governance positively influence environmental outcomes. Khassawneh et al. (2024) and Elzek et al. (2021) demonstrate the role of green leadership and innovations in promoting eco-innovation and customer satisfaction in Dubai's hospitality industry and Egyptian travel agencies and hotels, respectively, emphasizing the moderating role of environmental commitment. Senbeto (2024) underscores the importance of linking pilgrimage capabilities and religious organizations to sustain green innovation in pilgrimage tourism destinations.

Additionally, Cordente-Rodríguez et al. (2022) highlight the importance of local population support and perception in the sustainable management of natural areas. Scuttari et al. (2021) discuss the use of design thinking in destination planning to promote sustainability-oriented innovations, integrating creative engagement to encourage local support. Satta et al. (2019) identify the role of green innovation in fostering value creation activities in tourism. He et al. (2018) emphasize the importance of government incentive mechanisms in promoting green innovation among tourism enterprises, driving economic benefits.

Economic impacts of SOI on tourism

Implementing green technologies and sustainable practices in tourism leads to cost savings, enhanced competitiveness, and new revenue streams. Studies show that businesses adopting sustainable practices experience increased operational efficiency and reduced costs. For example, Razumova et al. (2015) and Garay et al. (2019) found that environmental innovations in Majorcan hotels and sustainability-oriented practices improve financial performance by attracting eco-conscious customers and reducing waste. Sunarya et al. (2023) and Warren et al. (2018) underscore the significance of green supply chain management and continuous learning in enhancing the performance and long-term economic benefits of small and medium-sized tourism enterprises through sustainability-oriented service innovations.

Green certifications and eco-labels differentiate businesses in competitive markets.

Cheng et al. (2022) and Melane-Lavado et al. (2018) found that green marketing strategies significantly influence customers' green behavioral intentions, leading to increased patronage, loyalty, and foreign direct investment in sustainable tourism infrastructure, which fosters environmental protection, boosts economic growth, creates jobs, and stimulates local economies. Cantino et al. (2019) show how the Fontanafredda winery's sustainable business model creates competitive advantages and drives economic sustainability in the wine tourism sector. Álvarez-García et al. (2022) highlight the role of leaders' sustainability competencies in enhancing the economic performance of small and medium-sized enterprises (SMEs) through social entrepreneurial orientation.

Further studies support these findings. Liu et al. (2023), Khassawneh et al. (2024), and Fernández-Torres et al. (2021) explore the threshold effect of tourism industrial agglomeration on green innovation

efficiency, green leadership in Dubai's hospitality industry, and gender-diverse boards in tourism companies, showing how these factors enhance economic performance. Ji et al. (2023) and Hu et al. (2020) discuss the role of environmental management systems and green financing in promoting green innovation, contributing to economic performance, with Paniccia and Leoni (2019) revealing how the Albergo Diffuso model creates synergies with its territory, enhancing destination competitiveness and economic sustainability. Tugores and García (2015) analyze the impact of various innovations on hotel performance in Majorca, showing that while some environmental innovations have positive impacts, others require regulatory intervention for broader adoption. Satta et al. (2019) support the role of green innovation in driving sustainable tourism and value creation, highlighting the fragmented research that necessitates further exploration. Senbeto (2024) highlights the role of religious organizations in promoting green innovative behavior, supporting economic sustainability in pilgrimage destinations.

Social impacts of SOI on tourism

Our review reveals that while green innovations have been widely studied in terms of their environmental and economic benefits, their social impacts remain underexplored. This study synthesize existing research this gap by highlighting the role of community involvement and social equity in promoting sustainable tourism. Additionally, we identify the moderating effects of environmental commitment on the relationship between green leadership and customer satisfaction, a finding that extends the work of Khassawneh et al. (2024) and Elzek et al. (2021).

SOIs in tourism significantly promote community involvement, enhance customer satisfaction, and foster social equity. These practices often lead to increased community engagement as tourism businesses adopt methods that benefit local populations (Álvarez-García et al., 2022). Sustainable tourism development in Greece and tourists' perceptions of environmentally responsible practices by tourism businesses involve local communities in decision-making processes, boosting community morale, supporting local economies, and leading to higher customer satisfaction and repeat visits (Triantafillidou & Tsiaras, 2018). Bhutto et al. (2021) and Costa (2020) explore the role of green inclusive leadership and the importance of inclusive tourism practices in fostering green creativity, work engagement, and accessible and equitable tourism experiences, emphasizing the importance of relational leadership styles in promoting sustainable practices. Sharma and Bhat (2023) examine the contribution of community involvement toward social and environmental innovation in sustainable tourism, highlighting the positive impact on local communities.

Customer satisfaction is a critical social impact. Sustainable practices, such as eco-friendly accommodations and responsible tourism activities, attract tourists who prioritize sustainability. Cheng et al. (2022) found that green marketing strategies positively influence customers' intentions, leading to higher satisfaction and loyalty. This preference for sustainable businesses drives positive reviews and repeat visits (Chipunza, 2020).

Social equity is also enhanced through sustainable tourism practices. Ochoa-Jiménez et al. (2021) and Al-Romeedy and El-Sisi (2024) discuss how knowledge management in Mexican tourism companies and green innovations in travel agencies and hotels promote fair labor practices, equitable opportunities for local workers, and fair wages. Ananzeh et al. (2021) show that sustainable innovation strategies in the UAE tourism sector significantly enhance service quality, improving social equity by creating better job opportunities and working conditions.

Studies support these findings by showing diverse positive social impacts. Bhutto et al. (2021) and Fernández-Torres et al. (2021) explore how green inclusive leadership and gender-diverse boards in the tourism sector promote green creativity and environmental innovation, leading to a more satisfied workforce. Liu et al. (2023) and Khassawneh et al. (2024) emphasize the role of tourism in economic and social advancement and the role of green leadership in promoting sustainable practices.

Additional studies, such as Zhao et al. (2022) and Razzaq et al. (2023), demonstrate how green technology innovation improves ecological and social outcomes. Sun et al. (2022) showcases the positive social impacts of green practices in China's tourism industry. Guinot et al. (2023) highlight how corporate social responsibility enhances social well-being. Yang et al. (2022) and Aziz and Sarwar (2023) emphasize the social benefits of promoting green technologies and adopting green practices in tourism.

Integrated framework for evaluating sustainability-oriented innovations in tourism

Our bibliometric review of sustainability-oriented innovations (SOIs) in tourism identifies key research areas, highlighting significant impacts on the environment, particularly in terms of resource conservation and pollution reduction. Razumova et al. (2016) illustrate successful implementations of climate change mitigation strategies and water-saving innovations in heritage buildings and hotels. The analysis of the reviewed literature aligns with the principles of Ecological Modernization Theory (EMT), which is frequently applied in the existing studies to understand the integration of environmental and economic objectives through technological innovations and eco-friendly practices. The adoption of green technologies and renewable energy installations, as discussed by Elzek et al. (2021) and Jacob et al. (2010), exemplifies EMT's emphasis on enhancing operational efficiency while conserving natural resources and reducing pollution. Studies by Cheng et al. (2022), Meyer et al. (2022), and Thongma et al. (2017) further support EMT by showcasing the role of green marketing, cultural and creative industries, and environmental education in promoting sustainable behaviors among tourists. This aligns with EMT's focus on social equity, fair labor practices, and community involvement (Huber, 2000; Mol & Spaargaren, 2000).

The economic benefits of SOIs in tourism are evident through increased operational efficiency, cost savings, and enhanced competitiveness. Studies by Razumova et al. (2015) and Garay et al. (2019) demonstrate how environmental innovations and sustainability-oriented practices attract eco-conscious customers and improve financial performance by reducing waste. This is consistent with the principles of Triple Bottom Line (TBL) Theory, which underscores the need to balance economic, social, and environmental objectives. Green certifications and eco-labels, as discussed by Cheng et al. (2022) and Melane-Lavado et al. (2018), highlight the economic benefits of differentiation in competitive markets, leading to increased patronage and foreign direct investment. The findings of Cantino et al. (2019) on the Fontanafredda winery's sustainable business model further reinforce TBL Theory by demonstrating how sustainable practices can create competitive advantages and drive economic sustainability in the tourism sector.

The social impacts of SOIs, including community involvement, customer satisfaction, and social equity, are crucial for promoting sustainable tourism. Our review reveals that these practices often lead to increased community engagement and support local economies (Andereck, 2009; Triantafillidou & Tsiaras, 2018). This aligns with Diffusion of Innovations (DoI) Theory, which examines how innovations spread within the tourism sector through perceived advantages, compatibility, and the roles of early adopters and change agents (Dibra, 2015; Rogers, 2003). Bhutto et al. (2021) and Costa (2020) explore the role of green inclusive leadership and the importance of inclusive tourism practices in fostering green creativity and work engagement. These findings support the DoI Theory's emphasis on communication channels and social systems that facilitate innovation diffusion. Additionally, studies by Ochoa-Jiménez et al. (2021) and Al-Romeedy and El-Sisi (2024) highlight how knowledge management and green innovations promote fair labor practices and equitable opportunities, further emphasizing the social dimension of TBL Theory.

This study offers significant contributions by developing a bibliometric approach that integrates EMT, DoI Theory, and TBL Theory, synthesizing the impacts of SOIs in tourism as identified in the existing literature. This novel framework can guide future research in exploring the complex interactions between environmental, economic, and social dimensions of sustainability in tourism. This novel framework can guide future research in exploring the complex interactions between environmental, economic, and social dimensions of sustainability in tourism. To structure this review, we identified three main themes and their respective research questions, which are represented in the following framework (Figure 3):

This study contributes to the theoretical understanding of SOIs by integrating EMT, DoI Theory, and TBL Theory. It demonstrates how these frameworks can be applied to analyze the multifaceted impacts of SOIs in tourism, providing a holistic understanding of their benefits and challenges. By linking theoretical insights with empirical findings, this study bridges the gap between theory and practice, offering a robust framework for future research.

Limitations

We acknowledge that our study has several limitations. Firstly, relying on previous literature means our findings are subject to the inherent biases present in those studies. Publication bias may have resulted

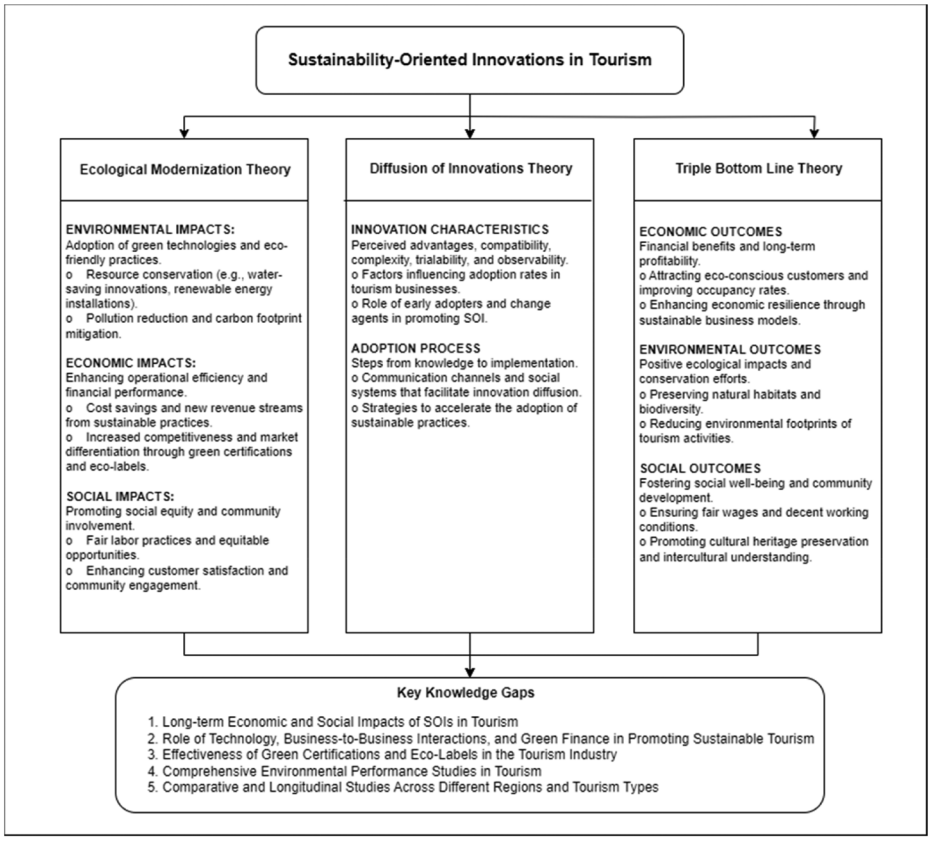

Figure 3. Integrated framework for evaluating sustainability-oriented innovations in tourism.
Source: Developed by authors (2024).

in the overrepresentation of studies with positive findings regarding SOIs in tourism. Additionally, by including only English-language articles, we may have excluded relevant research published in other languages, introducing language bias.

Furthermore, the bibliometric analysis is limited to articles indexed in the Scopus database up to June 2024, which may not capture the most recent developments or studies published elsewhere. These limitations suggest that our conclusions should be interpreted with caution and highlight the need for future research to include a broader range of sources.

Practical implications

For policymakers, the synthesized literature suggests that targeted policies and incentives can promote the adoption of SOIs in tourism. For example, providing tax breaks or subsidies for businesses that implement green technologies can encourage wider adoption. Policymakers should also consider developing regulations that set minimum sustainability standards in the tourism industry, fostering an environment that supports sustainable practices.

For tourism practitioners, integrating SOIs can lead to cost savings and competitive advantages. Businesses should conduct sustainability audits to identify areas where eco-friendly practices can be implemented, such as energy efficiency improvements or waste reduction strategies. Engaging with local communities and stakeholders can also enhance social equity and customer satisfaction, as emphasized in the literature.

Conclusion

This bibliometric review provided a comprehensive synthesis of the impacts of Sustainability-Oriented Innovations (SOIs) on tourism, through the integration of Ecological Modernization Theory (EMT), Diffusion of Innovations (DoI) Theory, and Triple Bottom Line (TBL) Theory. By systematically analyzing 88 studies,

we have highlighted the multifaceted effects of SOIs across environmental, economic, and social dimensions in the tourism sector.

Our analysis indicates that while SOIs significantly contribute to environmental sustainability by promoting resource conservation and pollution reduction, there is a need for more in-depth studies on their long-term environmental impacts and scalability across different tourism contexts. Economically, although SOIs are shown to enhance financial performance and competitiveness, the literature lacks comprehensive evaluations of the cost-benefit dynamics over time and in varying economic conditions. Socially, despite evidence that SOIs foster community involvement and social equity, there is limited research on their effects on marginalized groups and how they influence social cohesion within tourism destinations.

These findings reveal specific knowledge gaps that warrant further exploration. By investigating these questions, future studies can build upon our synthesis to deepen the understanding of SOIs and their potential to transform the tourism industry towards greater sustainability. Future research should address questions such as:

1. How do SOIs impact the long-term environmental sustainability of tourism destinations across different geographical regions?
2. What are the cost-benefit dynamics of implementing SOIs in small versus large tourism enterprises over time?
3. In what ways do SOIs affect marginalized communities within tourism destinations, and how can they be designed to enhance social equity and inclusion?

The implications of our findings are substantial for both academic research and practical applications. Academically, this study advances the discourse by integrating multiple theoretical perspectives, offering a nuanced understanding of how technological innovations, policy measures, and business practices interact within the tourism sector. Practically, the insights provide actionable guidance for policymakers to develop targeted strategies that promote the adoption of SOIs, ensuring a balance between economic, social, and environmental objectives. Tourism practitioners can utilize these findings to refine their sustainability practices, enhance operational efficiency, and strengthen market competitiveness. Stakeholders, including local communities and tourists, stand to benefit from the positive outcomes associated with SOIs, such as increased community engagement and improved customer satisfaction.

Acknowledgments

The author expresses gratitude to the supervisors and academic staff at the Faculty of Social and Political Sciences, Universitas Padjadjaran, for their valuable support and guidance during the research process.

Author contributions

1. Muhammad Fikry Aransyah: Conceptualization, Methodology, Writing – Original Draft, Visualization, Investigation.
2. Bambang Hermanto (Supervisor): Supervision, Project Administration, Funding Acquisition.
3. Anang Muftiadi (Co-Supervisor): Supervision, Validation, Writing – Review & Editing.
4. Hera Oktadiana (Co-Supervisor): Supervision, Methodology, Writing – Review & Editing.

All authors have read and approved the final version of this work.

Disclosure statement

The authors report there are no competing interest to declare.

Funding

This research was supported by the Lembaga Pengelola Dana Pendidikan (LPDP) scholarship during the author's Ph.D. studies. Additionally, the Article Processing Charge (APC) for this publication was covered by the Faculty of Social and Political Science, Universitas Padjadjaran.

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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