

Article

The Current Overview of Sustainability Indicators Related to Sustainable Tourism: A Systematic Literature Review

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ABSTRACT

The objective of this literature review is to map the state of the art of sustainability indicators applied to tourism, identifying advances, gaps, and opportunities for improvement, in order to provide a critical view on the use of these tools in monitoring and developing sustainable tourism practices. Sustainable tourism requires analytical tools capable of balancing environmental, economic, and sociocultural dimensions. Sustainability indicators are fundamental resources for measuring impacts, supporting public policies, and encouraging the adoption of more sustainable practices in the sector. This article presents a current overview of the main indicators used, through a systematic review based on a structured protocol that covers the search, selection, analysis, and synthesis of relevant studies. The results highlight the historical evolution of indicators, recurring methodological approaches, and challenges such as the lack of standardization and adaptation to local realities. A theoretical framework aligned with the Sustainable Development Goals (SDGs) is proposed, offering recommendations for theoretical and practical advances in the field.

Keywords: sustainable tourism; sustainability indicators; systematic literature review; sustainable development goals (SDGs); sustainable management.

RESUMO

O objetivo desta revisão de literatura é mapear o estado da arte dos indicadores de sustentabilidade aplicados ao turismo, identificando avanços, lacunas e oportunidades de aprimoramento, de modo a proporcionar uma visão crítica sobre o uso dessas ferramentas no monitoramento e desenvolvimento de práticas turísticas sustentáveis. O turismo sustentável exige instrumentos analíticos capazes de equilibrar as dimensões ambiental, econômica e sociocultural. Os indicadores de sustentabilidade constituem recursos fundamentais para mensuração de impactos, suporte a políticas públicas e incentivo à adoção de práticas mais sustentáveis no setor. Este artigo apresenta um panorama atual dos principais indicadores utilizados, por meio de uma revisão sistemática fundamentada em protocolo estruturado que abrange busca, seleção, análise e síntese de estudos relevantes. Os resultados evidenciam a evolução histórica dos indicadores, abordagens metodológicas recorrentes e desafios como ausência de padronização e adaptação às realidades locais. Propõe-se um arcabouço teórico alinhado aos Objetivos de Desenvolvimento Sustentável (ODS), oferecendo recomendações para o avanço teórico e prático no campo.

Palavras-chave: turismo sustentável; indicadores de sustentabilidade; revisão sistemática de literatura; objetivos de desenvolvimento sustentável (ods); gestão sustentável.



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Introduction

Sustainability indicators in tourism have been recognized as essential tools for guiding practices aligned with sustainable development in environmental, social, and economic dimensions, especially amid the intensification of tourist flows and their impacts (Amado & Rodrigues, 2021; Han, 2021; Brooks et al., 2023). Aligned with the Sustainable Development Goals (SDGs), these indicators seek to respond to monitoring and evaluation demands in contexts facing increasing environmental and social pressures, especially in regions subject to mass tourism (Saarinen, 2022; Frigidis, Riskos & Kotzaivazoglou, 2022). Technological advances, such as big data and intelligent automation, have increased the accuracy and scope of data collection and analysis, promoting more refined management of tourism resources (Majid et al., 2023; Rahmadian, Feitosa & Zwitter, 2022). However, the literature exposes limitations, especially regarding the standardization, integration, and application of these indicators in diverse geographical and cultural realities, hindering comparisons and the development of strategies that can be widely replicated (Giampiccoli, Mtapuri & Dłużewska, 2020; Ekka & Annamalai, 2022; Gidebo, 2021).

Most studies reveal the adoption of fragmented approaches, compromising the construction of strategies that transcend the local context (Rustini et al., 2022; Tahiri, Kovaci & Trajkovska Petkoska, 2022). There is also a lack of assessments of the long-term effectiveness of indicators and their real capacity to inform public policies and business practices that promote change in the sector (McCool & Bosak, 2020; Jones & Comfort, 2020). In this scenario, it is essential to conduct a critical mapping that brings together advances, gaps, and opportunities, supported by systematic reviews capable of consolidating the knowledge produced and subsidizing the creation of measurement models that are more adjusted to local realities, including new global challenges such as the COVID-19 pandemic (Chang, McAleer & Ramos, 2020; Palazzo et al., 2022). By conducting a rigorous systematic review, this study seeks to answer how sustainable tourism indicators can be organized and evaluated to qualify practices and promote advances in the monitoring and sustainable development of tourism.

The methodological protocol followed the PRISMA guidelines, with searches conducted in academic reference databases such as Scopus, Web of Science, and ScienceDirect, using keywords related to sustainability indicators and sustainable tourism. The process included the identification, selection, analysis, and synthesis of studies, which allowed not only to reconstruct the evolutionary trajectory of the indicators but also to highlight methodological approaches and applications in different economic and geographical contexts (Dube, 2020; Khan et al., 2021; Ye, Ye & Law, 2020). Three main contributions emerge: the systematic organization of recent advances in sustainable tourism indicators (Martínez-Martínez et al., 2023; McCool & Bosak, 2020; Rahmadian et al., 2022); the proposal of a theoretical framework that integrates these indicators with the SDGs and highlights their relevance for public policies and business strategies (Cristobal-Fransi et al., 2020; Frigidis et al., 2022; Majid et al., 2023); and the presentation of guidelines for future research, emphasizing the need to expand the applicability of indicators in the face of heterogeneous regional realities (Saarinen, 2022; Palazzo et al., 2022; Rustini et al., 2022).

The study proposes guidelines for improving indicators, aligning them with the SDGs and emphasizing their usefulness in sustainable tourism governance (Khan et al., 2021; Saarinen, 2022; Wilson & Smith, 2024). The methodological and conceptual improvement of these instruments offers ways for managers and policymakers to identify more responsible practices, adapt strategies to specific contexts, and consolidate tourism development that responds to current social, environmental, and economic demands. Thus, the research makes a relevant contribution to the literature by consolidating advances, structuring gaps, and proposing paths for the evolution of indicators, reaffirming their centrality to the strengthening of sustainable tourism in the coming decades.



Finally, the use of big data and artificial intelligence is recommended to improve the collection, analysis, and visualization of indicators, enabling more efficient and responsive management.

Literature Review

Definition of Sustainable Tourism

The concept of sustainable tourism is intrinsically linked to the challenge of balancing the pursuit of economic benefits, environmental preservation, and the sociocultural well-being of local communities. It has established itself as a theoretical and practical response to growing global demands for development scenarios that respect the planet's limits and promote social equity (Amado & Rodrigues, 2021; Ammirato et al., 2020; Brooks et al., 2023). In this sense, sustainable tourism goes beyond simply minimizing the negative impacts of the sector, constituting a proactive strategy to integrate economic, social, and environmental practices in a harmonious and lasting manner. The literature highlights its relevance as an instrument of transformation capable of promoting regional development and cultural appreciation, while aligning with the Sustainable Development Goals (SDGs) (Cristobal-Fransi et al., 2020; Fragidis et al., 2022; Khan et al., 2021).

Sustainable tourism is often defined as tourism that meets the needs of present generations without compromising the ability of future generations to meet their own demands. This definition, although widely accepted, reflects only part of its complexity, as the concept evolves to incorporate interdisciplinary dimensions and adaptations to local realities (Dube, 2020; Ekka & Annamalai, 2022; Duarte et al., 2023). In the theoretical field, there is a diversity of approaches that explore the intersection between sustainability and tourism, ranging from the management of ecological resources to the strengthening of local communities as central actors in the development process (Giampiccoli et al., 2020; Hasana et al., 2022; Rustini et al., 2022). This plurality, while enriching, also exposes gaps in the standardization of practices and the establishment of clear metrics to evaluate the success of sustainable initiatives.

When addressing sustainable tourism, authors have emphasized the importance of integrating emerging technologies and innovative methodologies that amplify the impact of sustainable practices. For example, recent studies highlight the use of intelligent automation and big data as tools to improve the management of tourist destinations, identify consumption patterns, and predict socio-environmental impacts (Rahmadian et al., 2022; Majid et al., 2023; Prados-Castillo et al., 2023). This perspective points to a future in which innovation plays a central role in consolidating sustainable tourism as a globally relevant practice. However, challenges related to technological accessibility and regional inequalities remain evident, requiring more inclusive and collaborative approaches (Huang et al., 2023; Wilson & Smith, 2024; Winarto, 2024).

Another fundamental aspect in defining sustainable tourism is its ability to strengthen local communities through participatory and collaborative approaches. The literature emphasizes that by placing residents at the center of decisions, it is possible to promote social and economic empowerment while preserving cultural and natural heritage (Brooks et al., 2023; Saarinen, 2022; Zmysłony et al., 2020). In this sense, sustainable tourism acts as a catalyst for building social capital, fostering partnerships between governments, businesses, and civil society in pursuit of common goals. This collaborative approach becomes even more relevant in crisis scenarios, such as the impact of the COVID-19 pandemic, which highlighted the need for resilience and adaptation in the tourism sector (Chang et al., 2020; Jones & Comfort, 2020; Palazzo et al., 2022).



Table 1: Definitions of Sustainable Tourism and Its Key Elements

Autor(es)	Definição de Turismo Sustentável	Pontos-Chave	Principais Focos	Elementos Relevantes
Amado & Rodrigues (2021)	Turismo que equilibra as necessidades econômicas, ambientais e sociais das comunidades locais.	Integração de dimensões econômicas, sociais e ambientais.	Planejamento sustentável e valorização cultural.	Estratégias para inclusão das comunidades locais no planejamento turístico.
Ammirato et al. (2020)	Abordagem sistêmica para integrar práticas agrícolas e turísticas de forma sustentável.	Conexão entre sustentabilidade e agroturismo.	Sustentabilidade econômica, preservação ambiental e fortalecimento comunitário.	Estudos de caso em agroturismo, promovendo sustentabilidade integrada.
Brooks et al. (2023)	Prática de turismo que visa promover o desenvolvimento comunitário sustentável e o bem-estar das comunidades locais.	Desenvolvimento sustentável de comunidades locais e preservação cultural.	Relação entre turismo, saúde comunitária e desenvolvimento local.	Impacto do turismo no bem-estar e saúde das comunidades anfitriãs.
Chang et al. (2020)	Panorama de turismo resiliente que equilibra os impactos da COVID-19 com práticas sustentáveis.	Resiliência em tempos de crise, equilíbrio entre recuperação econômica e sustentabilidade.	Sustentabilidade pós-pandemia e fortalecimento de panoramas turísticos.	Proposta de carta para práticas turísticas sustentáveis após a pandemia.
Cristóbal-Franci et al. (2020)	Turismo sustentável como uma abordagem de marketing voltada para práticas que respeitam o ambiente e as comunidades.	Integração de marketing sustentável ao turismo.	Promoção de práticas turísticas sustentáveis e conscientização do consumidor.	Utilização de estratégias de marketing para educar turistas sobre sustentabilidade.
Dube (2020)	Alinhamento do turismo com os Objetivos de Desenvolvimento Sustentável (ODS) para promover impactos positivos globais.	Foco nos ODS e no impacto global do turismo sustentável.	Sustentabilidade global, desenvolvimento econômico e preservação ambiental.	Aplicação prática dos ODS como diretrizes para o turismo sustentável.
Giampiccoli et al. (2020)	Turismo sustentável baseado na participação ativa de comunidades locais como beneficiárias diretas do desenvolvimento.	Participação comunitária, foco no empoderamento social e econômico.	Turismo comunitário, desenvolvimento local e sustentabilidade cultural.	Enfoque na integração comunitária como elemento central do turismo sustentável.
Majid et al. (2023)	Turismo sustentável orientado por tecnologias emergentes e automação inteligente.	Uso de automação e big data para gestão sustentável de destinos.	Tecnologia aplicada ao turismo sustentável, previsão de impactos e otimização de recursos.	Conexão entre inovação tecnológica e práticas turísticas sustentáveis.
Saarinen (2022)	Turismo sustentável como uma prática alinhada às geografias de desenvolvimento sustentável e preservação ecológica.	Foco na integração de práticas sustentáveis com a geografia local.	Sustentabilidade ecológica, planejamento regional e preservação ambiental.	Impacto ambiental e geográfico como diretrizes para práticas sustentáveis.
Sharpley (2023)	Governança sustentável do turismo, equilibrando responsabilidades locais e globais.	Governança local e global, integração de stakeholders.	Políticas públicas, equilíbrio entre governança local e global.	Propostas para governança sustentável no turismo, considerando diversos níveis de gestão.

Fonte: Autoria Própria (2025)

Although the definition of sustainable tourism is widely discussed and applied in different contexts, significant theoretical gaps remain. The lack of consensus on global metrics, the difficulty of adapting to local contexts, and the limited integration of new technologies are recurring challenges that require continuous attention from researchers and practitioners in the sector (Kurniawan, 2024; Martínez-Martínez et al., 2023; Streimikiene et al., 2021). Thus, this study seeks to contribute to the advancement of this discussion by presenting a systematic and in-depth review of the indicators that underpin sustainable tourism practices, with the aim of consolidating a robust theoretical framework that is applicable in various scenarios.

Historical and Contextual Evolution of Sustainability Indicators

The trajectory of sustainability indicators in tourism shows a continuous process of methodological improvement and conceptual expansion, seeking to respond to demands for economic development, environmental conservation, and social justice. Initially limited to isolated environmental measurements, these instruments have come to incorporate social and cultural variables over the decades, as highlighted by Amado and Rodrigues (2021), who point to the importance of valuing the role of local communities in territorial planning. The advancement of agrotourism exemplifies this movement by integrating sustainable agricultural practices and environmental criteria (Ammirato et al., 2020). The literature indicates that global crises, such as the COVID-19 pandemic, have acted as catalysts in the revision of these indicators, broadening their sensitivity



to issues such as economic resilience, health, and well-being, and promoting closer alignment with the Sustainable Development Goals (Chang, McAleer & Ramos, 2020; Brooks et al., 2023).

The recent development of indicators has benefited from the incorporation of advanced technologies, such as big data and artificial intelligence, which optimize both data collection and analysis, providing greater accuracy and customization of sustainability strategies (Loureiro & Nascimento, 2021; Majid et al., 2023). Despite this progress, challenges related to technological accessibility and international standardization persist, limiting the dissemination and applicability of the instruments in different contexts, as noted by Kurniawan (2024). At the same time, the literature emphasizes that improving indicators requires an approach that is more sensitive to inclusion, social justice, and the participation of host communities, correcting deficiencies in previous overviews that disregarded cultural and social specificities (Giampiccoli, Mtapuri & Dłużewska, 2020; Rustini et al., 2022).

The contemporary design of indicators therefore requires guiding principles that ensure clear parameters that are adaptable and consistent with different local realities. Amado and Rodrigues (2021) reinforce that the construction of these metrics must be based on reliable and adaptable data, ensuring the legitimacy and applicability of the results. The effective participation of communities in the process of developing indicators, as highlighted by Giampiccoli, Mtapuri, and Dłużewska (2020), strengthens social capital and promotes empowerment, while Brooks et al. (2023) highlight the need to measure factors related to health, well-being, and cultural heritage. This participatory approach is essential to ensure that the results reflect local specificities and promote equity.

The literature points to the urgency of indicators aligned with the SDGs, developed from ethical and interdisciplinary principles, which incorporate variables from different areas of knowledge to capture the effects of sustainable tourism in a more comprehensive way (Saarinen, 2022; Dube, 2020; Martínez-Martínez, Cegarra-Navarro & Garcia-Perez, 2023). Technologies such as blockchain are suggested to ensure greater transparency and reliability (Prados-Castillo et al., 2023), and the adaptability of indicators in the face of crises reinforces their importance in constantly changing global contexts (Chang, McAleer & Ramos, 2020; Loureiro & Nascimento, 2021). Thus, the principles for developing sustainable indicators in tourism must reconcile technological innovation, local adaptation, and ethical commitment, promoting metrics capable of driving truly transformative practices.

Relationship between Indicators and Sustainable Development Goals (SDGs)

The link between sustainability indicators in tourism and the Sustainable Development Goals (SDGs) reinforces the sector's alignment with the global goals established by the UN's 2030 Agenda. Amado and Rodrigues (2021) argue that the relevance of indicators lies in their ability to translate principles such as reducing inequalities (SDG 10) and protecting life on land (SDG 15) into concrete metrics, enabling continuous monitoring of the progress promoted by sustainable tourism initiatives. In this scenario, interdisciplinarity emerges as a requirement, incorporating social, cultural, and economic dimensions to more accurately capture the impacts of tourism.

Brooks et al. (2023) highlight that sustainable tourism contributes to health and well-being (SDG 3), as well as to quality education (SDG 4), especially in experiences that value culture and strengthen communities. Ammirato et al. (2020) highlight the relevance of agrotourism in promoting goals related to zero hunger and sustainable agriculture (SDG 2), provided that indicators monitor practices that consolidate sustainability. In turn, Khan et al. (2021) emphasize the importance of monitoring the generation of quality jobs and equity in the distribution of benefits (SDG 8) in a , while Dube (2020) reinforces the need to align tourism strategies with the goals of inclusion and social justice.



The adoption of emerging technologies has strengthened the relationship between indicators and SDGs. Loureiro and Nascimento (2021) point out that big data and artificial intelligence increase the accuracy of metrics and enable real-time analysis, favoring more assertive decisions. Prados-Castillo et al. (2023) suggest the use of blockchain to improve the transparency of indicators, especially in areas such as responsible consumption (SDG 12) and innovation (SDG 9), promoting the integration of variables and greater confidence in the results obtained.

The indicators also contribute to strengthening strategic partnerships (SDG 17), promoting coordination between governments, the private sector, and communities, as advocated by Martínez-Martínez, Cegarra-Navarro, and Garcia-Perez (2023). By being designed to capture the effects of these partnerships, the indicators strengthen institutional capacities and drive sustainable practices. This interrelationship enhances the capacity of sustainable tourism to catalyze change at different scales, provided that the development of indicators considers both local challenges and global priorities, ensuring their usefulness and relevance to the 2030 Agenda.

Methodology

The review was conducted based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, ensuring the transparency and reproducibility of the process (Brooks et al., 2023; Ekka & Annamalai, 2022; Kurniawan, 2024). The methodological protocol was structured in three main stages: search, selection, and analysis/synthesis of relevant studies.

Search and Identification of Studies

The initial search was conducted in three academic databases widely recognized for the quality and scope of their publications: Scopus, Web of Science, and ScienceDirect (Amado & Rodrigues, 2021; McCool & Bosak, 2020; Prados-Castillo et al., 2023). We used combinations of keywords related to the topic, such as "sustainability indicators," "sustainable tourism," and "sustainable development," applying specific filters to refine the results. Only articles published between 2020 and 2024 were considered in order to ensure the timeliness and relevance of the information (Fragidis, Riskos & Kotzaivazoglou, 2022; Rustini et al., 2022).

This step resulted in an initial corpus of 215 studies, which were then screened in detail based on the reading of abstracts and the application of exclusion criteria, such as duplication, lack of focus on specific indicators, or non-adherence to the proposed theme (Huang et al., 2023; Martínez-Martínez et al., 2023; Majid et al., 2023). After applying these filters, the number of articles was reduced to 40 studies, which comprised the final corpus for in-depth analysis.

Selection and Categorization

The selected articles were organized into distinct categories based on previously established criteria: research objective, methodology employed, geographic application, and alignment with the Sustainable Development Goals (SDGs) (Saarinen, 2022; Giampiccoli, Mtapuri & Dłużewska, 2020; Han, 2021). The methodological classification revealed a predominance of qualitative studies and a notable scarcity of comparative empirical research, highlighting a significant gap in the literature (Jones & Comfort, 2020; McCool & Bosak, 2020).

In addition, the identified indicators were systematically grouped into three main dimensions: environmental, social, and economic (Hasana, Swain & George, 2022; Dube, 2020; Rahmadian, Feitosa & Zwitter, 2022). This grouping allowed for a more detailed analysis of trends and challenges, such as the difficulty of standardizing indicators and the need for greater interdisciplinary integration.



Analysis and Critical Synthesis

The final stage consisted of a critical analysis of the categorized studies, highlighting the main trends and identifying important gaps for future research (Ammirato et al., 2020; Yang et al., 2023; Winarto, 2024). A synthesis of the evidence was carried out, emphasizing the importance of adapting indicators to local specificities and promoting their practical applicability in the context of sustainable tourism (Tahiri, Kovaci & Trajkovska Petkoska, 2022; Sharpley, 2021; Wilson & Smith, 2024).

The results point to the need to develop a more robust and adaptable theoretical framework capable of integrating sustainability indicators into regional dynamics and promoting more effective management of tourist destinations (Genç, 2020; Loureiro & Nascimento, 2021; Streimikiene et al., 2021).

The protocol adopted in this systematic review allows for the reproducibility of the study in future research. The application of the PRISMA guidelines ensured a rigorous and structured methodological process, which can be replicated by researchers interested in mapping and evaluating sustainability indicators in other areas or related sectors (Amado & Rodrigues, 2021; Saarinen, 2022; Martínez-Martínez et al., 2023).

The organization of the process into three main stages (search, selection, and analysis/synthesis) facilitates the systematization of procedures and reduces subjectivity in the screening and categorization of studies. The detailed categorization of articles according to criteria such as objective, methodology, and geographical application ensures a comprehensive analysis and contributes to the development of practical guidelines applicable in the context of sustainable tourism (Fragidis, Riskos & Kotzaivazoglou, 2022; Dube, 2020; Loureiro & Nascimento, 2021).

The analysis of existing gaps, combined with the identification of emerging trends, provides an updated theoretical framework applicable to both public policy development and the management of sustainable business practices (Sharpley, 2021; Genç, 2020; McCool & Bosak, 2020).

Results and Discussion: Systematic Literature Review of Sustainability Indicators linked to Sustainable Tourism

Types of Sustainable Tourism Indicators

The types of indicators in sustainable tourism cover environmental, economic, and sociocultural dimensions, reflecting the diversity of aspects to be monitored and evaluated. Amado and Rodrigues (2021) indicate that environmental metrics monitor impacts on ecosystems, such as emissions, resource use, and biodiversity conservation. Economic indicators deal with financial viability, job creation, and income distribution, while sociocultural indicators analyze the impact on communities, heritage, and quality of life. These categories reveal complementary functions in measuring the sector's sustainability.

The growing focus on environmental indicators stems from the need to mitigate the negative impacts of tourism on natural resources. Fragidis, Riskos, and Kotzaivazoglou (2022) advocate for their inclusion in long-term strategies, and Huang et al. (2023) suggest linking them to environmental education to raise awareness among tourists and operators. Such metrics not only help measure impacts but also serve as educational and engagement tools.

In the economic field, Genç (2020) highlights innovation in business models as a differentiator for sustainability, while Dube (2020) emphasizes its contribution to the SDGs, especially in reducing poverty and generating decent jobs. Kurniawan (2024) points out that clear economic indicators favor attracting investment and underpin public policies aimed at sustainability.

Sociocultural indicators complete the picture by prioritizing well-being, health, education, and the preservation of local traditions (Brooks et al., 2023; Giampiccoli, Mtapuri & Dłużewska, 2020). Their



articulation with sustainable marketing strategies strengthens destinations that value local identities, while the integration between typologies, enhanced by automation and big data (Martínez-Martínez et al., 2023; Majid et al., 2023), is fundamental for a more comprehensive and systemic measurement of sustainability in tourism.

Table 2: Types of Sustainable Tourism Indicators

Tipo de Indicador	Descrição	Exemplos Práticos	Relevância para a Literatura e a Prática
Ambientais	Indicadores que medem os impactos do turismo nos ecossistemas e nos recursos naturais. Incluem métricas relacionadas ao consumo de energia, água, emissões de carbono e biodiversidade.	- Taxa de emissões de CO ₂ por turista. - Consumo de água em hotéis. - Índices de preservação de áreas naturais.	Fundamentais para identificar e mitigar impactos ambientais, promovendo a adoção de práticas sustentáveis no setor (Amado & Rodrigues, 2021; Fragidis et al., 2022).
Econômicos	Avaliam a viabilidade financeira e o impacto econômico do turismo em nível local, regional e global. Consideram geração de empregos, contribuição ao PIB e distribuição de renda.	- Percentual de empregos gerados pelo turismo. - Receita anual gerada por atividades turísticas.	Cruciais para mensurar o papel do turismo no crescimento econômico e na equidade financeira (Dube, 2020; Genç, 2020).
Socioculturais	Medem os impactos do turismo sobre a cultura, tradições e comunidades locais, além de aspectos como qualidade de vida e bem-estar social.	- Número de eventos culturais preservados. - Satisfação das comunidades locais com o turismo.	Essenciais para promover a coesão social e preservar o patrimônio cultural (Giampiccoli et al., 2020; Brooks et al., 2023).
Tecnológicos	Indicadores que utilizam tecnologias como big data, inteligência artificial e blockchain para monitorar e otimizar práticas sustentáveis.	- Análises de fluxo de turistas por meio de big data. - Monitoramento de pegada de carbono com blockchain.	Potencializam a eficiência no monitoramento e aumentam a precisão das métricas sustentáveis (Loureiro & Nascimento, 2021; Majid et al., 2023).
Governança e Políticas	Avaliam a efetividade de políticas públicas e panoramas de governança na implementação de práticas sustentáveis.	- Número de políticas públicas voltadas para o turismo sustentável. - Índice de participação de stakeholders.	Garantem que as estratégias sejam implementadas de forma eficiente e participativa (Sharpley, 2023; Kurniawan, 2024).
Educacionais e de Conscientização	Medem o impacto de iniciativas educacionais e de conscientização ambiental relacionadas ao turismo sustentável.	- Percentual de turistas informados sobre práticas sustentáveis. - Número de programas de educação ambiental.	Importantes para fomentar o engajamento de turistas e comunidades em práticas sustentáveis (Huang et al., 2023; Fragidis et al., 2022).
ODS-Alinhados	Indicadores que verificam a contribuição do turismo para o cumprimento dos Objetivos de Desenvolvimento Sustentável (ODS).	- Contribuição do turismo para o ODS 8 (emprego e crescimento econômico). - Preservação da biodiversidade (ODS 15).	Fundamentais para alinhar o turismo às metas globais da Agenda 2030 (Dube, 2020; Saarinen, 2022; Winarto, 2024).
Bem-Estar e Saúde	Focam nos impactos do turismo na saúde física e mental dos turistas e das comunidades locais.	- Índices de saúde das comunidades anfitriãs. - Impactos positivos do turismo no bem-estar dos visitantes.	Demonstram a relação entre turismo sustentável e melhoria na qualidade de vida (Brooks et al., 2023; Santos-Roldán et al., 2020).

Fonte: Autoria Própria (2025)

The diversity of indicator types reflects the complexity of sustainable tourism and the need for interdisciplinary and collaborative approaches. Although the challenges are significant, advances in literature and practice suggest that well-designed and integrated indicators have the potential to transform the tourism sector into a catalyst for sustainable development. By considering environmental, economic, and sociocultural dimensions, indicators promote more responsible management and ensure that the benefits of sustainable tourism are widely distributed and long-lasting.

Environmental Indicators

Environmental indicators are indispensable tools for measuring the impacts of tourism activities on the environment and supporting strategies aimed at mitigating adverse effects on ecosystems. Amado and Rodrigues (2021) note that such metrics cover carbon emissions, water use, waste management, and biodiversity conservation, promoting tourism planning that is mindful of minimizing environmental damage and the rational use of resources in sensitive areas. The analysis of consumption and disposal patterns allows for the formulation of strategies aimed at reducing the ecological footprint, a central factor for the sustainability of tourist destinations.

The incorporation of technologies such as big data and georeferencing enhances the real-time analysis of tourist flows and contributes to the control of overloads in protected natural environments, as argued by Fragidis, Riskos, and Kotzaivazoglou (2022). Huang et al. (2023) advocate the inclusion of environmental



education as a central element in the interpretation of these indicators, stimulating greater awareness among tourists and operators. Integrating educational information into monitoring systems encourages behavioral change in line with the preservation of local ecosystems.

In addition, environmental indicators qualify the evaluation of public policies in tourism by providing parameters for monitoring impacts and informing future decisions. Dube (2020) warns that the lack of reliable metrics compromises policies aimed at reconciling economic growth and environmental preservation. Kurniawan (2024) adds that aligning indicators with the SDGs, especially on biodiversity and climate action, enhances the relevance of these tools for sustainable development.

The literature highlights the importance of metrics adapted to regional, cultural, and sectoral contexts. Ammirato et al. (2020) emphasize the need for specific indicators for rural tourism, while Brooks et al. (2023) highlight metrics aimed at areas of natural and cultural heritage. By considering local singularities, the applicability of indicators is broadened and the articulation between communities and sustainable tourism management is strengthened.

Table 3: Environmental Indicators in Sustainable Tourism

Tipo de Indicador Ambiental	Autores	Descrição	Aplicação Prática	Contribuições Relevantes
Emissões de Carbono	Amado & Rodrigues (2021); Fragidis et al. (2022); Huang et al. (2023)	Avalia a quantidade de CO ₂ emitida por atividades turísticas, incluindo transporte e operações.	Monitoramento de pegada de carbono em aeroportos e hotéis; incentivo ao uso de transportes mais limpos.	Proporciona dados para reduzir a pegada de carbono, alinhando o turismo às metas climáticas globais (ODS 13).
Consumo de Água	Ammirato et al. (2020); Kurniawan (2024); Dube (2020)	Mede a quantidade de água utilizada em operações turísticas, especialmente em áreas de escassez.	Implementação de práticas de reutilização de água em resorts; uso de dispositivos de economia de água.	Importante para promover o uso eficiente de recursos hídricos em destinos com estresse hídrico.
Gestão de Resíduos	Brooks et al. (2023); Amado & Rodrigues (2021); Huang et al. (2023)	Avalia a quantidade e o destino dos resíduos gerados por turistas e empresas turísticas.	Programas de reciclagem em hotéis; redução de plásticos de uso único; compostagem de resíduos orgânicos.	Fomenta práticas sustentáveis em destinos turísticos e reduz impactos em ecossistemas frágeis.
Conservação da Biodiversidade	Fragidis et al. (2022); Ammirato et al. (2020); Kurniawan (2024)	Monitora os impactos do turismo na fauna e flora, especialmente em áreas protegidas.	Controle do número de visitantes em parques naturais; zoneamento de áreas sensíveis.	Essencial para equilibrar conservação ambiental e turismo, protegendo ecossistemas vulneráveis.
Qualidade do Ar	Jones & Comfort (2020); Dube (2020); Huang et al. (2023)	Mede os níveis de poluentes atmosféricos em destinos turísticos, especialmente em áreas urbanas.	Monitoramento em tempo real em cidades com alta densidade turística; políticas para limitar o uso de veículos poluentes.	Relevante para mitigar impactos do turismo urbano e melhorar a qualidade de vida de residentes e visitantes.
Uso de Energia Renovável	Genç (2020); Huang et al. (2023); Brooks et al. (2023)	Avalia o percentual de energia renovável utilizada por empresas turísticas.	Instalação de painéis solares em resorts; uso de energia eólica em destinos turísticos remotos.	Contribui para a transição energética do setor turístico, reduzindo a dependência de combustíveis fósseis.
Impacto no Solo e Erosão	Amado & Rodrigues (2021); Ammirato et al. (2020); Fragidis et al. (2022)	Mede os impactos do turismo na degradação do solo e na erosão de áreas naturais.	Planejamento de trilhas sustentáveis; controle da densidade de visitantes em áreas montanhosas.	Ajuda a preservar áreas sensíveis e a prevenir desastres ambientais relacionados ao uso excessivo do solo.
Relação com Ecossistemas Aquáticos	Kurniawan (2024); Fragidis et al. (2022); Amado & Rodrigues (2021)	Monitora os impactos do turismo em ecossistemas aquáticos, como rios, lagos e oceanos.	Proibição de ancoragem em áreas de corais; controle de poluição em regiões costeiras.	Crucial para a preservação de habitats marinhos e para o turismo sustentável em destinos costeiros e insulares.
Sensibilidade Climática	Dube (2020); Huang et al. (2023); Amado & Rodrigues (2021)	Avalia a vulnerabilidade de destinos turísticos às mudanças climáticas e a resiliência ambiental.	Planejamento de adaptações em áreas de alto risco, como zonas costeiras suscetíveis à elevação do nível do mar.	Garante que destinos turísticos estejam preparados para enfrentar os impactos das mudanças climáticas.

Fonte: Autoria Própria (2025)

Environmental indicators are indispensable tools for the advancement of sustainable tourism, providing a solid basis for monitoring, managing, and implementing practices that minimize the negative impacts of tourism activities on the environment. The literature points to the need for an integrated approach that combines technological advances, environmental education, and contextual adaptation, ensuring that these indicators continue to play a central role in balancing tourism development and environmental preservation.



Economic Indicators

Economic indicators are fundamental for assessing the financial viability of sustainable tourism, measuring job creation, revenue, income distribution, and infrastructure investments. Amado and Rodrigues (2021) emphasize the importance of integrating these metrics into tourism planning, ensuring lasting benefits for local economies, including increased tax revenues and returns to host communities. In agritourism, such indicators measure the impact of visitor spending on boosting the rural economy, supporting producers and small businesses (Ammirato et al., 2020).

In addition, the evaluation of sustainable tourism marketing highlights the return on responsible campaigns, expanding the redistribution of wealth among economic sectors (Cristobal-Fransi et al., 2020). Frigidis et al. (2022) argue that the analysis should include social inclusion metrics, such as local job creation and equitable remuneration, connecting tourism to the Sustainable Development Goals, especially poverty eradication and the promotion of decent work.

The literature also emphasizes the need to measure the economic resilience of tourist destinations in the face of crises, assessing their capacity for adaptation and recovery (Jones & Comfort, 2020). Giampiccoli et al. (2020) argue that sustainable tourism should prioritize marginalized communities, promoting a more equitable distribution of financial flows. Innovations in business models can strengthen economic inclusion and broaden the benefits among different actors (Genç, 2020).

The systematic analysis of economic indicators informs public policy, guiding investments in infrastructure, worker training, and sustainable transportation, which positively impact both the economy and the environment (Kurniawan, 2024; Olszewski-Strzyżowski, 2022).

Table 4: Types of Economic Indicators in Sustainable Tourism

Tipo de Indicador Econômico	Autores	Descrição	Aplicação Prática	Contribuições Relevantes
Geração de Empregos	Amado & Rodrigues (2021); Frigidis et al. (2022); Genç (2020)	Avalia a quantidade e qualidade dos empregos gerados pelo setor turístico, com foco na inclusão de trabalhadores locais e na promoção de condições de trabalho decentes.	Implementação de políticas para incentivar a contratação local, monitoramento de condições de trabalho e inclusão de populações marginalizadas em áreas turísticas.	Promove inclusão econômica local e ajuda a medir o impacto social das atividades turísticas, alinhando-se aos ODS, como o trabalho decente e crescimento econômico (ODS 8).
Receita Gerada pelo Turismo	Ammirato et al. (2020); Cristobal-Fransi et al. (2020); Kurniawan (2024)	Mede a receita gerada diretamente pelos turistas, incluindo gastos em hospedagem, alimentação, transporte e entretenimento, com ênfase no fortalecimento da economia local.	Avaliação da viabilidade econômica de destinos turísticos e do retorno financeiro de investimentos em infraestrutura e marketing sustentável.	Facilita o planejamento econômico de destinos, identificando áreas de investimento prioritário e incentivando práticas de consumo responsáveis.
Redistribuição de Renda	Giampiccoli et al. (2020); Jones & Comfort (2020); Olszewski-Strzyżowski (2022)	Analisa como os benefícios financeiros do turismo são distribuídos entre comunidades locais, pequenas empresas e grandes players do mercado.	Desenvolvimento de políticas públicas para redistribuição justa, como taxas turísticas revertidas em programas de apoio a pequenos negócios e comunidades locais.	Garante equidade econômica e fortalece a resiliência financeira de comunidades anfitriãs, reduzindo disparidades econômicas regionais.
Resiliência Econômica	Jones & Comfort (2020); Frigidis et al. (2022); Genç (2020)	Avalia a capacidade dos destinos turísticos de se adaptarem e se recuperarem de crises econômicas ou ambientais, como a pandemia de COVID-19.	Planejamento de estratégias de recuperação econômica e diversificação de atividades turísticas para aumentar a resiliência financeira em momentos de crise.	Contribui para a sustentabilidade econômica a longo prazo, mitigando impactos negativos de crises globais no setor turístico.
Investimentos em Infraestrutura	Kurniawan (2024); Olszewski-Strzyżowski (2022); Genç (2020)	Monitora os investimentos realizados em infraestrutura turística e avalia o retorno financeiro e social desses investimentos.	Implementação de projetos de infraestrutura sustentável, como transporte público eficiente, energia renovável em instalações turísticas e acessibilidade para todos os turistas.	Ajuda a justificar investimentos públicos e privados em infraestrutura, promovendo práticas sustentáveis e atraindo turistas com menor impacto ambiental.
Contribuições Fiscais do Turismo	Amado & Rodrigues (2021); Ammirato et al. (2020); Frigidis et al. (2022)	Mede a arrecadação fiscal proveniente do turismo, como impostos sobre serviços turísticos, e seu impacto nas finanças públicas locais.	Monitoramento das contribuições fiscais e implementação de taxas sustentáveis, como taxas de conservação ambiental ou impostos específicos para turistas.	Permite maior planejamento orçamentário por parte das autoridades locais, incentivando o reinvestimento dos recursos em ações de sustentabilidade e desenvolvimento social.
Inclusão Econômica	Giampiccoli et al. (2020); Frigidis et al. (2022); Genç (2020)	Analisa a participação econômica de populações locais e grupos marginalizados no setor turístico, promovendo sua inclusão como stakeholders no desenvolvimento econômico.	Políticas de capacitação e empoderamento de comunidades locais para que possam participar diretamente de atividades turísticas, como guias, artesãos e fornecedores de produtos.	Reduz desigualdades sociais, melhora a equidade econômica e fortalece o capital social em destinos turísticos.
Custo-Benefício de Panoramas de Negócio	Genç (2020); Ammirato et al. (2020); Kurniawan (2024)	Avalia a eficiência econômica de panoramas de negócios turísticos, considerando custos operacionais e retorno financeiro sustentável.	Implementação de panoramas de negócios inovadores, como cooperativas locais e iniciativas de turismo comunitário, otimizando custos e maximizando benefícios financeiros e sociais.	Promove a viabilidade econômica de práticas turísticas sustentáveis, incentivando negócios com impacto positivo no meio ambiente e na sociedade.

Fonte: Autoria Própria (2025)

Economic indicators develop essential pathways for sustainable tourism planning and management, allowing for the measurement of direct economic benefits and the analysis of their distribution and long-term impact. These indicators facilitate the integration of economic, environmental, and social sustainability,



promoting more inclusive tourism aligned with the SDGs. By combining financial metrics with factors of social inclusion and resilience, these indicators establish a solid basis for strategic decision-making in the tourism sector.

Sociocultural Indicators

Sociocultural indicators play a crucial role in assessing the impacts of sustainable tourism on local communities and visitors. These indicators are fundamental tools for understanding how tourism practices affect the cultural, social, and behavioral aspects of the populations involved, promoting a balance between development and cultural preservation. According to Brooks et al. (2023), the interaction between tourism and local culture requires an approach that considers the health and well-being of host communities, integrating practices that minimize negative impacts and maximize social benefits. This perspective is expanded upon by Giampiccoli et al. (2020), who argue that sustainability in tourism must encompass environmental preservation and the appreciation and strengthening of cultural traditions and practices. In turn, Ammirato et al. (2020) highlight that agrotourism, for example, is a scenario that reinforces the connection between visitors and rural communities, creating opportunities for the transmission of cultural knowledge and practices.

The relationship between sociocultural indicators and the protection of intangible heritage is a widely discussed topic in the literature. According to Amado and Rodrigues (2021), the integration of sustainable tourism planning with the appreciation of local cultural heritage contributes significantly to the preservation of endangered cultural practices. This approach is also corroborated by Tahiri et al. (2022), who examine how tourism can be a vehicle for promoting cultural diversity by encouraging the production and consumption of authentic local products. In addition, Fragidis et al. (2022) emphasize that the visitor experience should be designed to include the active participation of the local community, ensuring that the interaction between tourists and hosts results in mutual enrichment.

Sociocultural indicators also assess the impact of tourism on the lifestyle of local communities. Duarte et al. (2023) note that lifestyle-based entrepreneurship is a strategy that harmonizes economic development with social sustainability, encouraging small businesses that promote cultural authenticity and community well-being. Along the same lines, Rustini et al. (2022) highlight the importance of community participation in the development of tourism activities, strengthening the sense of belonging and reducing social tensions caused by invasive tourism activities. These ideas are complemented by Loureiro and Nascimento (2021), who point out that emerging technologies can be used to preserve cultural elements and improve the tourist experience without harming local traditions.

Another central aspect of sociocultural indicators is measuring the community's perception of the impact of tourism. According to Jones and Comfort (2020), it is essential to monitor how residents perceive changes in their quality of life and culture due to tourism. This analysis helps identify potential conflicts and create strategies to mitigate adverse impacts. Similarly, Saarinen (2022) explores how aligning tourism practices with the Sustainable Development Goals (SDGs) can promote social inclusion and strengthen the social capital of local communities. The work of Palazzo et al. (2022) also highlights how global crises, such as the COVID-19 pandemic, have exposed the vulnerability of local communities to tourist flows, reinforcing the need for indicators that measure sociocultural resilience.



Table 5: Sociocultural Indicators in Sustainable Tourism

Tipo de Indicador Sociocultural	Autores	Descrição	Aplicação Prática	Contribuições Relevantes
Preservação do Patrimônio Cultural	Amado e Rodrigues (2021); Tahiri et al. (2022); Fragidis et al. (2022)	Avalia a capacidade do turismo de proteger práticas culturais, tradições locais e patrimônio imaterial.	Implementação de iniciativas culturais em roteiros turísticos, como festivais locais, workshops de artesanato e visitas a sítios históricos.	Promove a valorização e preservação de práticas culturais ameaçadas, fortalecendo a identidade cultural das comunidades locais.
Engajamento Comunitário	Rustini et al. (2022); Duarte et al. (2023); Loureiro e Nascimento (2021)	Mede o nível de participação da comunidade local no desenvolvimento e na gestão do turismo.	Criação de conselhos locais de turismo e incentivos para pequenos empreendedores comunitários.	Garante que os benefícios do turismo sejam distribuídos de forma equitativa, fortalecendo o senso de pertencimento e reduzindo tensões sociais.
Percepção da Qualidade de Vida	Jones e Comfort (2020); Saarinen (2022); Palazzo et al. (2022)	Avalia como os moradores locais percebem o impacto do turismo sobre sua qualidade de vida e bem-estar cultural.	Aplicação de pesquisas e questionários para medir a satisfação da comunidade com o turismo em sua região.	Identifica áreas de conflito e orienta políticas para mitigar impactos negativos, promovendo um turismo mais inclusivo e sustentável.
Resiliência Sociocultural	Brooks et al. (2023); Sharpley (2023); Pahrudin et al. (2022)	Monitora a capacidade das comunidades locais de se adaptar às mudanças causadas pelos fluxos turísticos.	Desenvolvimento de planos de emergência cultural e parcerias com organizações para proteger tradições durante crises globais.	Aumenta a capacidade das comunidades de manter práticas culturais autênticas, mesmo diante de desafios externos, como pandemias ou crises econômicas.
Promoção da Diversidade Cultural	Giampiccoli et al. (2020); Tahiri et al. (2022); Amado e Rodrigues (2021)	Mede a integração de elementos culturais diversos nas atividades turísticas.	Curadoria de roteiros que incluam diferentes tradições, gastronomias e práticas culturais em uma mesma região.	Estimula o intercâmbio cultural, promovendo a valorização da diversidade e fortalecendo a tolerância cultural entre visitantes e anfitriões.
Educação e Sensibilização Cultural	Fragidis et al. (2022); Duarte et al. (2023); Loureiro e Nascimento (2021)	Avalia os esforços para educar turistas sobre o respeito às culturas locais.	Desenvolvimento de programas de educação cultural, guias turísticos treinados e sinalização informativa em atrações turísticas.	Reduz conflitos culturais e garante experiências mais enriquecedoras para turistas e comunidades.

Fonte: Autoria Própria (2025)

The implementation of sociocultural indicators requires an integrated approach that considers both the interests of local communities and the demands of tourists. Sharpley (2023) emphasizes that sustainable tourism governance must be a joint effort between local, regional, and global stakeholders to ensure equity in cultural and social benefits. This point is expanded upon by Pahrudin et al. (2022), who suggest that the promotion of authentic cultural practices, combined with ethical marketing strategies, can have a positive and lasting impact on host communities and visitors. Thus, sociocultural indicators measure the effects of tourism and guide policies and practices that promote a sustainable balance between development and cultural preservation.

Technological Indicators

Technological indicators are emerging as fundamental tools in the development of sustainable tourism, especially as technology advances to offer innovative solutions that assist in data collection, predictive analysis, and stakeholder engagement. These indicators provide support for efficient resource management, promotion of sustainable practices, and monitoring of the impact of tourism in the environmental, social, and economic spheres. Amado and Rodrigues (2021) highlight that the implementation of smart systems and digital technologies has been crucial for monitoring the carrying capacity of tourist destinations, promoting a more balanced and sustainable experience. In addition, these tools are also essential for informing tourists about responsible practices, strengthening the link between technology and environmental awareness.

In the context of data analysis, Majid et al. (2023) argue that artificial intelligence and intelligent automation play a vital role in forecasting tourist flows and allocating resources in high-demand destinations. These indicators are particularly useful for preventing problems associated with overtourism, as they enable proactive planning based on historical patterns and real-time predictions. Similarly, Loureiro and Nascimento (2021) explore how big data technologies have the potential to capture tourist behavior patterns, providing valuable information for strategic and sustainable decision-making by destination managers. This technological integration facilitates the development of more informed and adaptive policies, meeting the needs of different stakeholders.



Another relevant aspect is the use of blockchain-based platforms to promote transparency and accountability in the tourism value chain. Prados-Castillo et al. (2023) point out that these platforms offer a decentralized approach to tracking activities and transactions, ensuring that benefits are distributed fairly among local communities and other agents. This technology can also be used to authenticate ecological practices, such as the certification of sustainable tourism services. Fragidis et al. (2022) complement this view by emphasizing that the digitization of tourism allows for greater operational efficiency and the creation of new business scenarios that prioritize sustainability, promoting the digital inclusion of local communities.

The use of technologies for tourist engagement and education is also indispensable. Martínez-Martínez et al. (2023) highlight the role of interactive digital platforms and mobile applications in informing tourists about sustainable practices and local cultural values, raising awareness and promoting a more enriching experience. Wilson and Smith (2024) reinforce this perspective by mentioning that destinations that invest in educational technologies, such as augmented reality and virtual tours, are able to attract diverse audiences while preserving the integrity of local heritage. These technological efforts are essential to align tourists' expectations with the sustainability goals of destinations, creating a virtuous cycle of responsible practices.

Table 6: Technological Indicators in Sustainable Tourism

Tipo de Indicador Tecnológico	Autores	Descrição	Aplicação Prática	Contribuições Relevantes
Indicadores de Capacidade de Carga Inteligente	Amado & Rodrigues (2021), Fragidis et al. (2022), Wilson & Smith (2024)	Sistemas baseados em inteligência artificial e machine learning que analisam dados de fluxo de turistas para prever capacidade de carga e evitar overtourism.	Implementação em destinos turísticos de alta demanda para ajustar dinamicamente o número de visitantes permitidos, garantindo um equilíbrio sustentável.	Melhor gestão de fluxos turísticos, evitando degradação ambiental e preservando a experiência dos visitantes.
Indicadores de Big Data	Loureiro & Nascimento (2021), Majid et al. (2023), Prados-Castillo et al. (2023)	Utilização de grandes volumes de dados para mapear padrões de comportamento turístico e tendências de viagem.	Uso em plataformas de gestão de destinos para prever demandas sazonais e ajustar ofertas de serviços.	Decisões mais informadas, melhoria na experiência do visitante e suporte a estratégias de marketing sustentável.
Indicadores de Blockchain	Prados-Castillo et al. (2023), Fragidis et al. (2022), Martínez-Martínez et al. (2023)	Tecnologia que garante transparência e rastreamento em transações na cadeia de valor do turismo.	Aplicação em sistemas de certificação de práticas sustentáveis e monitoramento de impacto econômico local.	Fortalecimento da confiança entre stakeholders, distribuição justa de benefícios e autenticação de práticas ecológicas.
Indicadores de Engajamento Digital	Wilson & Smith (2024), Martínez-Martínez et al. (2023), Amado & Rodrigues (2021)	Ferramentas digitais, como aplicativos e plataformas interativas, que educam turistas sobre práticas sustentáveis e cultura local.	Uso em destinos turísticos para promover comportamentos sustentáveis por meio de realidade aumentada e tours virtuais.	Aumento da conscientização ambiental, preservação de patrimônio cultural e inclusão de comunidades locais.
Indicadores de Automação Inteligente	Majid et al. (2023), Fragidis et al. (2022), Loureiro & Nascimento (2021)	Automação de processos de gestão turística utilizando inteligência artificial para eficiência operacional.	Gerenciamento automatizado de reservas, logística e alocação de recursos em destinos.	Redução de custos operacionais, aumento da eficiência e suporte à sustentabilidade econômica.
Indicadores de Monitoramento em Tempo Real	Huang et al. (2023), Amado & Rodrigues (2021), Martínez-Martínez et al. (2023)	Sensores e dispositivos IoT para coleta de dados em tempo real sobre impacto ambiental e comportamento dos turistas.	Aplicação em parques naturais e destinos sensíveis para monitoramento contínuo de indicadores ambientais e sociais.	Melhor resposta a emergências, preservação de ecossistemas e gestão adaptativa de recursos.
Indicadores de Educação Tecnológica	Wilson & Smith (2024), Martínez-Martínez et al. (2023), Fragidis et al. (2022)	Plataformas educacionais que promovem práticas sustentáveis e valores culturais por meio de tecnologias avançadas.	Uso em escolas e comunidades locais para capacitação e sensibilização de residentes e visitantes.	Promoção de conhecimento e integração social, fortalecendo o vínculo entre tecnologia e sustentabilidade.

Fonte: Autoria Própria (2025)

Technological indicators in sustainable tourism provide a solid basis for data analysis and management and also foster innovations that positively transform the way destinations are managed. The integration of these tools is indispensable for balancing tourism growth with environmental protection, community well-being, and sustainable economic development.



Governance and Policy Indicators

Governance and policies play a central role in the development and management of sustainable tourism, as they establish guidelines that guide responsible practices in tourist destinations. These indicators are essential for monitoring the effectiveness of government initiatives and promoting the participation of various stakeholders. Amado and Rodrigues (2021) highlight the importance of public policies that integrate sustainable urban planning and regional development strategies, particularly in less developed areas such as Oecusse-Ambeno in Timor-Leste. These policies ensure a balance between economic growth and environmental protection and encourage social inclusion and the empowerment of local communities. On the other hand, the review by Brooks et al. (2023) reveals how community governance can strengthen the health and well-being of local populations, especially in destinations that prioritize heritage tourism, integrating cultural and social objectives.

Another essential aspect lies in adapting policies to the global context. Chang et al. (2020) emphasize that tourism, after the COVID-19 pandemic, required a restructuring of policies to integrate resilience and economic recovery. These policies are designed to mitigate the impacts of future crises while promoting more responsible and sustainable practices. The connection between local and global governance is emphasized by Sharpley (2023), who argues that sustainable governance must consider local specificities while aligning with global standards. This approach balances local demands with international commitments, such as the Sustainable Development Goals (SDGs). Furthermore, Dube (2020) explores how the SDGs shape tourism policies in Africa, highlighting the need for strategies adapted to local socioeconomic realities to achieve more effective results.

Community participation and inter-institutional collaboration are also key elements for the success of sustainable tourism policies. Giampiccoli et al. (2020) emphasize that including local communities in decision-making processes strengthens governance and ensures that the benefits of tourism are distributed equitably. This perspective is complemented by Tahiri et al. (2022), who investigate the role of tourism in promoting regional heritage, demonstrating how well-designed policies can preserve cultural traditions while fostering economic development. Genç (2020) addresses innovation in business landscapes as an extension of effective policies, promoting sustainability through business practices aligned with government guidelines.

In addition, Frigidis et al. (2022) emphasize the role of technology as a facilitator of governance in sustainable tourism. Technological tools, such as big data and artificial intelligence, help monitor and evaluate the effectiveness of policies, allowing for real-time adjustments. This approach is corroborated by Majid et al. (2023), who argue that intelligent automation can optimize administrative processes and improve transparency in resource allocation. Such technological advances provide governments with more robust tools to implement and monitor policies on a local and global scale, ensuring that sustainability efforts are measurable and aligned with strategic objectives.



Table 7: Governance and Policy Indicators in Sustainable Tourism

Tipo de Indicador de Governança e Políticas	Autores	Descrição	Aplicação Prática	Contribuições Relevantes
Planejamento Urbano Sustentável	Amado e Rodrigues (2021)	Foca na integração de políticas públicas que promovam o desenvolvimento sustentável em áreas urbanas e rurais, especialmente em regiões em desenvolvimento.	Aplicado em regiões como Oecusse-Ambeno, Timor Leste, por meio de estratégias regionais que combinam crescimento econômico e proteção ambiental.	Promove a inclusão social e o empoderamento das comunidades locais, além de equilibrar o desenvolvimento econômico com a preservação ambiental.
Políticas de Resiliência Pós-Crise	Chang et al. (2020); Sharpley (2023); Dube (2020)	Direcionadas para adaptar os sistemas de turismo às crises, como a pandemia de COVID-19, incorporando estratégias para recuperação econômica e sustentabilidade.	Implementação de políticas globais alinhadas aos ODS, com foco em resiliência e mitigação de impactos futuros em regiões afetadas por crises.	Oferecem uma estrutura para enfrentar crises globais e locais, alinhando práticas locais com compromissos globais, como os ODS.
Governança Comunitária e Inclusão	Giampiccoli et al. (2020); Tahiri et al. (2022); Genç (2020)	Enfatiza a inclusão de comunidades locais no processo de governança e formulação de políticas.	Aplicada em destinos que priorizam a preservação cultural e a equidade na distribuição de benefícios do turismo.	Garante a preservação de tradições culturais e promove o empoderamento local, enquanto fomenta práticas sustentáveis de desenvolvimento econômico.
Uso de Tecnologia na Governança	Fragidis et al. (2022); Majid et al. (2023); Streimikiene et al. (2021)	Incorpora ferramentas como big data e automação para monitorar a eficácia de políticas e melhorar a transparência.	Implementação de sistemas de monitoramento em destinos turísticos para avaliar práticas de governança em tempo real.	Melhora a transparência, otimiza alocação de recursos e permite ajustes rápidos em políticas para maior eficácia na gestão de sustentabilidade.
Governança Colaborativa	Wilson e Smith (2024); Streimikiene et al. (2021); Amado e Rodrigues (2021)	Promove a parceria entre setores público, privado e comunidades locais para a formulação e implementação de políticas.	Aplicada em destinos globais onde há necessidade de unir esforços entre múltiplos stakeholders para alcançar objetivos sustentáveis.	Facilita a legitimação de políticas e amplia a competitividade dos destinos turísticos por meio de uma abordagem integrada.
Promoção do Patrimônio Cultural e Regional	Brooks et al. (2023); Tahiri et al. (2022); Dube (2020)	Estabelece diretrizes para a preservação de tradições e a promoção de patrimônios locais como ativos turísticos.	Utilizada em contextos que combinam turismo patrimonial com objetivos econômicos e socioculturais.	Incentiva o turismo responsável, fortalece a identidade cultural local e estimula a economia regional por meio de práticas sustentáveis.

Fonte: Autoria Própria (2025)

The integration of multiple stakeholders in policy development is essential to ensure the legitimacy and effectiveness of initiatives. Streimikiene et al. (2021) suggest that the competitiveness and sustainability of tourist destinations are intrinsically linked to the quality of governance and the engagement of the actors involved. Promoting partnerships between the public and private sectors and local communities is an effective strategy for overcoming challenges and maximizing the benefits of sustainable tourism. Wilson and Smith (2024) reinforce this idea, highlighting that collaborative governance practices have been fundamental to achieving long-term goals in global destinations. Thus, governance and policy indicators remain indispensable tools for the progress of sustainable tourism, integrating economic, environmental, and sociocultural aspects in a coordinated effort.

Educational and Awareness Indicators

Educational and awareness indicators play a key role in sustainable tourism by enabling the building of collective knowledge and the promotion of responsible practices among tourists, local communities, and managers. These indicators reflect a commitment to training and awareness as tools for achieving sustainability in both the short and long term. Amado and Rodrigues (2021) highlight the relevance of educational strategies that combine elements of territorial planning with the inclusion of local communities, ensuring that the actors involved understand the environmental and sociocultural impacts of tourism activities. This approach is reinforced by Huang et al. (2023), who emphasize the integration of environmental education into ecotourism programs as an effective method for promoting ecological awareness and environmental preservation.

Awareness through educational strategies also contributes to the strengthening of cultural identities, as pointed out by Brooks et al. (2023), who investigate the relationship between heritage tourism and sustainable community development. In this context, educational indicators measure the effectiveness of programs that use tourism as a tool to rescue and value local traditions, promoting the health and well-being of host communities. In addition, Ammirato et al. (2020) emphasize the importance of including education in



agritourism as a way to transmit knowledge about sustainable agricultural practices, connecting tourists and farmers in a cycle of mutual learning that benefits both environmental preservation and the local economy.

Educational initiatives are also closely linked to consumer behavior, as noted by Han (2021), who highlights the role of environmental awareness in shaping tourist preferences and behaviors. Through educational indicators, it is possible to assess how awareness programs influence travel choices, encouraging sustainable consumption practices. The integration of technologies into these processes, as discussed by Frigidis et al. (2022), enables the personalization and expansion of the reach of educational campaigns, maximizing their impact in diverse cultural and geographical contexts.

The role of governments and non-governmental organizations in implementing educational policies is highlighted by Dube (2020), who associates the achievement of the Sustainable Development Goals (SDGs) with the effectiveness of awareness and training programs. Programs such as those analyzed by Giampiccoli et al. (2020) reinforce that the inclusion of local communities in educational processes promotes equity, but also strengthens collaborative governance, a critical element for sustainable tourism. On the other hand, Loureiro and Nascimento (2021) show how emerging technologies, such as augmented reality and gamification, can be used to create immersive educational experiences that sensitize tourists to local sustainability issues.

Measuring results is essential to ensure the effectiveness of educational programs, as emphasized by Martínez-Martínez et al. (2023), who analyze the role of knowledge management in sustainable tourism strategies. Educational indicators allow the impact of specific interventions, such as awareness campaigns or community training, to be monitored, ensuring that efforts are adjusted as necessary to achieve the established objectives. In addition, Sharpley (2023) suggests that such indicators help to assess how educational programs influence tourists' perceptions of sustainability, contributing to more ethical and responsible tourism.

Table 8: Educational and Awareness Indicators in Sustainable Tourism

Tipo de Indicador	Autores	Descrição	Aplicação Prática	Contribuições Relevantes
Educação para a Sustentabilidade Ambiental	Amado e Rodrigues (2021); Huang et al. (2023); Giampiccoli et al. (2020)	Indicadores que avaliam a integração de práticas de educação ambiental em programas de turismo sustentável, medindo o impacto em termos de preservação ecológica e engajamento comunitário.	Aplicados em ecoturismo e programas educativos para turistas e comunidades locais, como oficinas sobre biodiversidade e manejo de recursos naturais.	Promovem a conscientização ambiental, capacitando comunidades e turistas a adotar práticas sustentáveis e garantindo a preservação ambiental a longo prazo.
Conscientização Cultural	Brooks et al. (2023); Annunzio et al. (2020); Loureiro e Nascimento (2021)	Indicadores que medem a eficácia de programas educativos voltados à valorização e preservação de tradições culturais e práticas locais, vinculados ao turismo de patrimônio e agriturismo.	Implementados em roteiros culturais, festivais locais e visitas a áreas de patrimônio, envolvendo tanto turistas quanto comunidades locais.	Contribuem para a valorização da identidade cultural, promovem o turismo ético e fortalecem o vínculo entre turistas e comunidades.
Impacto Comportamental em Turistas	Han (2021); Frigidis et al. (2022); Sharpley (2023)	Avaliam a eficácia de programas que moldam o comportamento dos turistas em relação à sustentabilidade, incluindo consumo consciente e redução de impactos negativos.	Utilizados em campanhas de sensibilização que empregam tecnologias como realidade aumentada, aplicativos educacionais e gamificação.	Incentivam o consumo sustentável, promovem experiências imersivas e aumentam a responsabilidade ambiental dos turistas.
Capacitação Comunitária	Dube (2020); Giampiccoli et al. (2020); Martínez-Martínez et al. (2023)	Focados em programas que avaliam a capacitação das comunidades locais para o turismo sustentável, medindo seu impacto em termos de empoderamento e desenvolvimento econômico.	Aplicados em treinamentos e workshops para comunidades locais, promovendo competências em gestão sustentável e hospitalidade.	Reforçam a inclusão social, melhoram a governança local e aumentam a resiliência das comunidades diante de desafios turísticos.
Uso de Tecnologias Educacionais	Loureiro e Nascimento (2021); Martínez-Martínez et al. (2023); Frigidis et al. (2022)	Indicadores que analisam o uso de tecnologias emergentes para fins educacionais, avaliando seu impacto em programas de conscientização.	Aplicados em plataformas digitais e soluções tecnológicas para campanhas educativas, como aplicativos e experiências em realidade virtual.	Maximizam o alcance e a eficácia de programas educativos, promovendo engajamento e aprendizado interativo.
Promoção dos Objetivos de Desenvolvimento Sustentável (ODS)	Dube (2020); Huang et al. (2023); Amado e Rodrigues (2021)	Avaliam o alinhamento de programas educativos e de conscientização com os ODS, especialmente relacionados à sustentabilidade ambiental e inclusão social.	Incorporados em políticas públicas e programas intersetoriais que integram educação, turismo e sustentabilidade.	Garantem a coerência entre práticas locais e metas globais, promovendo impactos positivos em escala comunitária e internacional.

Fonte: Autoria Própria (2025)



Educational and awareness indicators play a central role in transforming tourism into a force for positive change. They enable the alignment of local practices with global goals, such as the SDGs, while promoting the empowerment of local communities and the active participation of tourists in sustainable initiatives. The literature reviewed highlights that the success of such initiatives depends on collaboration between different stakeholders, the effective use of emerging technologies, and an ongoing commitment to education as a strategic pillar of sustainable tourism.

SDG-Aligned Indicators

The alignment of sustainable tourism indicators with the Sustainable Development Goals (SDGs) represents a critical advance in the assessment and management of sustainability practices in the sector. Contemporary literature highlights how the SDGs provide a universally recognized framework, guiding the design of policies and practices in sustainable tourism. Amado and Rodrigues (2021) emphasize that the integration of the SDGs into tourism planning allows for a strategic approach that balances economic, environmental, and social needs. In this sense, these indicators monitor progress towards the SDGs and encourage concrete actions that promote social equity and environmental preservation. In addition, Ammirato et al. (2020) highlight the relevance of these indicators in agritourism contexts, where the economic sustainability of small communities is directly linked to the implementation of practices aligned with the SDGs. The creation of specific metrics that capture tourism's contribution to goals such as poverty eradication (SDG 1) and gender equality (SDG 5) is fundamental to establishing inclusive and sustainable tourism.

The practical application of SDG-aligned indicators is also widely discussed. For example, Chang et al. (2020) emphasize that, in response to global crises such as the COVID-19 pandemic, SDG-aligned indicators have proven essential for reconfiguring tourism in a more resilient and sustainable direction. They identify that these indicators can measure the effectiveness of policies that promote health and well-being (SDG 3), in addition to ensuring sustainable production and consumption patterns (SDG 12). In addition, Brooks et al. (2023) analyze the impact of these indicators on community development and the health of host communities, highlighting the interconnection between cultural heritage preservation and improved quality of life. Thus, the indicators provide an empirical basis for assessing the tangible contributions of tourism to sustainable development, amplifying its impact in local and global contexts.

Another relevant aspect is related to technological innovation and governance, often associated with SDG 9 (Industry, Innovation, and Infrastructure) and SDG 17 (Partnerships for the Goals). Loureiro and Nascimento (2021) explore how emerging technologies, such as big data and artificial intelligence, have facilitated the collection and analysis of data related to the SDGs, allowing for a more detailed and real-time assessment of tourism practices. Similarly, Martínez-Martínez et al. (2023) highlight the role of organizational knowledge management in promoting sustainability in tourism, arguing that the dissemination of successful practices aligned with the SDGs fosters organizational learning that can be replicated in different contexts. These technological advances increase the efficiency of data collection and expand the possibilities for international collaboration on sustainable tourism projects, as pointed out by Palazzo et al. (2022).

In addition, the relationship between SDG-aligned indicators and environmental preservation is widely recognized. Rustini et al. (2022) and Giampiccoli et al. (2020) highlight that environmental sustainability indicators often overlap with global environmental goals, such as biodiversity conservation (SDG 15) and ocean protection (SDG 14). The implementation of ecotourism programs that promote environmental awareness and education is a clear example of how these indicators can be used to achieve multiple SDGs simultaneously. Furthermore, Huang et al. (2023) demonstrate how environmental education initiatives linked to tourism have



encouraged significant behavioral changes among tourists, promoting more responsible and sustainable practices.

Table 9: SDG-Aligned Indicators in the Sustainable Tourism Literature

Tipo de Indicador ODS-Alinhado	Autores	Descrição	Aplicação Prática	Contribuições Relevantes
Eradicação da Pobreza (ODS 1)	Amado e Rodrigues (2021); Brooks et al. (2023); Rustini et al. (2022)	Indicadores que avaliam a contribuição do turismo para a geração de renda e melhoria da qualidade de vida de comunidades vulneráveis.	Aplicado em projetos comunitários que utilizam o turismo para gerar empregos locais e diversificar a economia regional, especialmente em áreas rurais.	Promovem a inclusão social e reduzem a desigualdade econômica, evidenciando o impacto do turismo na redução da pobreza e fortalecendo as comunidades.
Educação e Conscientização Ambiental (ODS 4 e ODS 13)	Huang et al. (2023); Giampiccoli et al. (2020); Palazzo et al. (2022)	Indicadores que medem o impacto de iniciativas educacionais e de conscientização ambiental promovidas por programas de turismo.	Utilizados em ecoturismo e programas educativos voltados para turistas e comunidades locais, incentivando práticas sustentáveis.	Contribuem para mudanças comportamentais sustentáveis e para o aumento do conhecimento ambiental, impactando diretamente na mitigação de mudanças climáticas e na conservação.
Redução das Desigualdades (ODS 10)	Dube (2020); Gidebo (2021); Ammirato et al. (2020)	Indicadores que avaliam a equidade na distribuição de benefícios econômicos e sociais gerados pelo turismo.	Aplicados em programas de turismo inclusivo que priorizam populações marginalizadas, como mulheres e comunidades indígenas.	Reduzem desigualdades estruturais e promovem maior justiça social no setor turístico.
Consumo e Produção Sustentáveis (ODS 12)	Chang et al. (2020); Cristóbal-Fransi et al. (2020); Rahmadian et al. (2022)	Indicadores que analisam práticas de gestão de recursos, minimização de resíduos e eficiência energética em destinos turísticos.	Implementados em políticas públicas e iniciativas privadas que monitoram e promovem práticas sustentáveis em hotéis, restaurantes e atrações turísticas.	Fortalecem a transição para panoramas econômicos circulares no turismo, reduzindo impactos ambientais.
Conservação da Biodiversidade (ODS 14 e ODS 15)	Rustini et al. (2022); Giampiccoli et al. (2020); Huang et al. (2023)	Indicadores que avaliam ações de preservação ambiental e proteção de ecossistemas frágeis em destinos turísticos.	Usados em programas de ecoturismo e turismo sustentável em áreas protegidas e regiões costeiras.	Contribuem para a manutenção da biodiversidade e a preservação de ecossistemas locais, integrando comunidades no processo de conservação.
Parcerias para os Objetivos (ODS 17)	Palazzo et al. (2022); Martínez-Martínez et al. (2023); Loureiro e Nascimento (2021)	Indicadores que avaliam a colaboração entre stakeholders, incluindo governos, ONGs e o setor privado, para o cumprimento dos ODS no turismo.	Aplicados em projetos que envolvem diferentes atores para desenvolver estratégias integradas de turismo sustentável.	Fortalecem a governança colaborativa e garantem a implementação eficaz de políticas sustentáveis alinhadas aos ODS.
Inovação e Infraestrutura (ODS 9)	Loureiro e Nascimento (2021); Palazzo et al. (2022); Rahmadian et al. (2022)	Indicadores que avaliam o uso de tecnologias avançadas, como big data e blockchain, para monitorar e promover sustentabilidade no turismo.	Empregados em plataformas digitais para gestão de destinos e análise de dados em tempo real sobre impactos ambientais e sociais.	Contribuem para a modernização do setor e para a tomada de decisão baseada em evidências, promovendo eficiência e inovação.

Fonte: Autoria Própria (2025)

SDG-aligned indicators also play a key role in monitoring social justice and economic equity in sustainable tourism. Dube (2020) and Gidebo (2021) analyze how these indicators can be used to ensure that the economic benefits of tourism are distributed fairly, reducing inequalities (SDG 10) and promoting decent work (SDG 8). The inclusion of metrics that assess the economic impact on marginalized communities is essential to avoid the pitfalls of predatory tourism and ensure that it becomes a transformative force for social and economic well-being. Thus, SDG-aligned indicators provide a framework for monitoring progress and encourage integrated actions that maximize the benefits of sustainable tourism on a global scale.

Well-being and Health Indicators

Well-being and health indicators in the context of sustainable tourism have stood out as fundamental elements for measuring the impacts of this sector on the quality of life of local communities and visitors. The literature points out that well-being is largely influenced by environmental, cultural, and economic factors, which, when well managed, contribute to physical, mental, and social health. Brooks et al. (2023) emphasize that health and well-being indicators should go beyond the assessment of tangible aspects, such as medical infrastructure, to include subjective dimensions, such as individuals' perception of safety and overall satisfaction with the tourist environment. This approach broadens the understanding of the impact of tourism on health



promotion, especially in community-based tourism contexts, where the inclusion of local communities in decision-making and management processes plays a vital role in strengthening social cohesion.

The link between well-being and health in sustainable tourism is also evident in health risk mitigation strategies, especially in times of crisis, as noted by Chang et al. (2020), who highlight the importance of specific indicators for monitoring the resilience of tourist destinations in the face of pandemics. These metrics include the responsiveness of local health systems and the implementation of hygiene and safety practices aimed at visitors and residents. On the other hand, Santos-Roldán et al. (2020) argue that tourism can function as a source of preventive health, providing opportunities for relaxation and reconnection with nature, especially in destinations that promote outdoor activities and ecotourism. This perspective reinforces the relevance of integrating well-being indicators into the planning and evaluation of public tourism policies.

In addition, well-being and health indicators assess local conditions and also act as strategic tools to enhance the attractiveness of destinations. For example, Amado and Rodrigues (2021) emphasize that sustainable tourism planning should incorporate metrics that assess the impact of tourism on the quality of life of local populations, such as expanded access to health and education services in previously marginalized communities. Complementarily, Giampiccoli et al. (2020) highlight that the well-being of local communities is intrinsically linked to the implementation of community-based tourism scenarios, which promote equity and strengthen social relations through participatory and inclusive practices.

Another relevant aspect concerns the relationship between well-being and environmental conservation, as noted by Rustini et al. (2022), who explore how the involvement of local communities in environmental preservation contributes to improving health and well-being. This connection occurs through the promotion of activities that integrate tourism, environmental education, and public health, creating a virtuous cycle of mutual benefits. In parallel, Loureiro and Nascimento (2021) discuss the importance of technology as a facilitator for monitoring health indicators, allowing for more accurate and real-time analyses of the impact of tourism activities in different contexts.

Table 10: Well-being and Health Indicators in the Context of Sustainable Tourism

Tipo de Indicador Ambiental	Autores	Descrição	Aplicação Prática	Contribuições Relevantes
Indicadores de Qualidade de Vida	Brooks et al. (2023); Amado e Rodrigues (2021); Santos-Roldán et al. (2020)	Avaliam aspectos subjetivos e objetivos do bem-estar, como satisfação geral, percepção de segurança e acesso a serviços básicos.	Monitoramento das condições de vida das comunidades locais e dos visitantes em destinos turísticos.	Promovem a inclusão social, fortalecem a coesão comunitária e ampliam o impacto positivo do turismo em populações vulneráveis.
Indicadores de Infraestrutura de Saúde	Chang et al. (2020); Giampiccoli et al. (2020); Loureiro e Nascimento (2021)	Mensuram a capacidade de resposta dos sistemas de saúde, incluindo acesso a cuidados médicos e disponibilidade de infraestrutura sanitária.	Planejamento de políticas públicas para garantir suporte adequado às demandas geradas pelo turismo.	Contribuem para a resiliência dos destinos turísticos frente a crises sanitárias e promovem segurança para visitantes e residentes.
Indicadores de Bem-Estar Psicológico	Santos-Roldán et al. (2020); Rustini et al. (2022); Brooks et al. (2023)	Medem a influência do turismo no relaxamento, redução de estresse e reconexão com a natureza.	Implementação de atividades turísticas voltadas para o bem-estar mental, como ecoturismo e turismo de aventura.	Fortalecem o turismo como ferramenta de promoção da saúde mental e bem-estar emocional.
Indicadores de Participação Comunitária	Rustini et al. (2022); Giampiccoli et al. (2020); Amado e Rodrigues (2021)	Avaliam o grau de envolvimento das comunidades locais na gestão e preservação ambiental.	Desenvolvimento de panoramas de turismo comunitário que integram saúde, educação ambiental e sustentabilidade.	Promovem a equidade social e o fortalecimento das relações comunitárias, gerando benefícios mútuos para residentes e visitantes.
Indicadores de Higiene e Segurança	Chang et al. (2020); Loureiro e Nascimento (2021); Santos-Roldán et al. (2020)	Monitoram padrões de higiene e segurança em destinos turísticos, especialmente em períodos de crise sanitária.	Implementação de protocolos de segurança para mitigar riscos e garantir a saúde de todos os envolvidos.	Estabelecem confiança nos destinos turísticos e promovem a sustentabilidade a longo prazo.
Indicadores de Educação e Conscientização em Saúde	Rustini et al. (2022); Brooks et al. (2023); Santos-Roldán et al. (2020)	Avaliam o impacto das atividades de educação ambiental e saúde pública no turismo.	Integração de programas educativos em destinos turísticos para visitantes e comunidades locais.	Criam ciclos virtuosos de saúde e sustentabilidade, reforçando o papel educativo do turismo.

Fonte: Autoria Própria (2025)



Well-being and health indicators in sustainable tourism cover a wide range of factors, from health infrastructure to the promotion of inclusive environmental and social practices. These indicators measure the impact of tourism and guide policies and practices that seek to balance economic objectives with human and environmental development. The adoption of robust and multidimensional metrics, such as those proposed by Brooks et al. (2023), Chang et al. (2020), and Santos-Roldán et al. (2020), is essential to ensure that tourism contributes significantly to global health and well-being.

Conclusion

The conclusion of this study summarizes the main findings, details how the systematic literature review was conducted to answer the research question, and discusses the theoretical and practical contribution to the sustainable tourism literature. In addition, managerial implications, recommendations for implementation, study limitations, and suggestions for future research are presented.

The systematic literature review, conducted following the PRISMA protocol, included a comprehensive search of databases such as Scopus, Web of Science, and ScienceDirect, using specific keywords related to sustainable tourism and sustainability indicators. The methodological analysis of the 40 selected articles allowed the indicators to be organized into environmental, social, economic, technological, and governance dimensions, highlighting gaps related to the lack of standardization and adaptation to local contexts. This systematic process made it possible not only to map the historical evolution of the indicators but also to identify predominant methodological approaches, practical applications, and opportunities for interdisciplinary integration.

The study confirmed that sustainable tourism indicators must be multidimensional and adaptable to regional and local realities. The analysis of the articles revealed that the integration of these indicators with local specificities increases the accuracy in assessing the impacts of tourism. In addition, it was highlighted that global practices adapted to regional contexts promote greater effectiveness in achieving sustainability goals. Indicators such as community empowerment, cultural preservation, and the implementation of green technologies emerged as essential tools for guiding concrete actions in the sector.

The research question—how can sustainable tourism indicators be structured and integrated into regional and local realities?—was answered by proposing a robust theoretical framework. The study achieved its objectives by presenting a systematic overview that guides the creation, adaptation, and implementation of indicators capable of measuring and promoting sustainable practices in tourism. This perspective provides a theoretical guide for academics and managers seeking to align tourism with global sustainable development goals.

The article expands the literature on sustainable tourism by proposing a theoretical framework that fills gaps related to the interdisciplinary integration and regionalization of indicators. It combines concepts of collaborative governance, green technologies, and cultural sustainability into a single framework. Unlike traditional frameworks, which often ignore the uniqueness of local contexts, this study emphasizes flexibility and adaptability. In addition, it advances theoretically by highlighting the relevance of indicators based on community participation and the application of emerging technologies, promoting a vision of sustainability guided by innovation and inclusion.

Public managers can use the developed framework to design policies more aligned with local needs, ensuring greater transparency and efficiency in the use of resources. The private sector, on the other hand, can use it as a strategic tool to implement sustainable tourism practices that meet the expectations of consumers and host communities. Indicators such as local economic impact and digitization for sustainable management allow companies to improve their operations, reduce costs, and increase their competitiveness in the global



market. In addition, integration between the public and private sectors is essential to align objectives and maximize sustainable results.

The study has some limitations. First, the theoretical proposal lacks empirical validation in different regional and cultural contexts. Although the framework is flexible, its practical application may face barriers, such as resistance from stakeholders or a lack of technological resources in certain regions. Furthermore, the focus on quantitative indicators may neglect the importance of qualitative perceptions, which are beneficial for understanding the impact of tourism on local communities.

Future research should empirically validate the proposed framework in different tourist destinations, exploring its effectiveness in diverse contexts. In addition, it is essential to investigate how the indicators can be adapted for emerging destinations and economically vulnerable regions. Additional studies could integrate more in-depth qualitative analyses, including stakeholder interviews and case studies to better understand social and cultural dynamics. Finally, the use of big data and artificial intelligence is recommended to improve the collection, analysis, and visualization of indicators, enabling more efficient and responsive management.

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