Middle East Journal of Scientific Publishing
Vol. (8) Issue (4)
Edition 28th
2025(1 - 26)

The Role of Smart Technologies in Advancing Sustainable Tourism: A Systematic Review

Yousef ALsaad

Published on: 6 September 2025

Abstract

Smart technologies have emerged as transformative tools in advancing sustainable tourism by enhancing efficiency, optimizing resource use, and creating personalized, immersive visitor experiences. This systematic review synthesizes scholarly literature published between 2015 and 2025 to examine the global role of digital innovations—such as the Internet of Things (IoT), artificial intelligence (AI), big data analytics, and immersive technologies—in promoting environmentally, economically, and socially sustainable tourism. Guided by PRISMA methodology, the study analyzes trends, thematic areas, and implementation challenges, with a contextual emphasis on Jordan as a representative case of an emerging tourism economy.

The findings reveal that smart technologies significantly contribute to sustainability through real-time monitoring, improved mobility, enhanced stakeholder collaboration, and more inclusive governance. Jordan's National Tourism Strategy (2021–2025) and eco-tourism projects demonstrate strong alignment with global smart tourism principles, yet face critical barriers including infrastructural limitations, fragmented policy frameworks, and digital capacity gaps. The review highlights key policy and practical implications, emphasizing the need for cross-sector collaboration, capacity building, ethical data governance, and financial incentives to scale smart solutions sustainably.

Research gaps are identified in areas such as long-term impact assessment, inclusive technology design, and adaptive governance. The study concludes by offering strategic recommendations and future research directions to guide policymakers,

practitioners, and scholars in leveraging smart technologies to enable resilient, inclusive, and sustainable tourism development.

Keywords: Smart tourism, sustainability, ICT, IoT, AI, big data, environmental impact, resource optimization, governance.

*** Introduction**

1- Background: Tourism is both a major driver of economic growth and a contributor to environmental pressures, accounting for around 8% of global greenhouse gas emissions(D. Liu et al., 2023). As industry expands, the tension between the pursuit of tourism-driven development and the imperative for environmental stewardship has intensified. In response, sustainable tourism has emerged as a guiding principle, seeking to balance visitor satisfaction, economic benefits, and the conservation of cultural and natural resources(Gretzel et al., 2015).

Over the past decade, the rapid evolution of smart technologies has presented unique opportunities for transforming tourism into a more sustainable, efficient, and inclusive sector. Smart tourism refers to the integration of advanced information and communication technologies (ICTs)—including the Internet of Things (IoT), artificial intelligence (AI), big data analytics, mobile platforms, cloud computing, and virtual/augmented reality—with traditional tourism systems(Sankar & Ilangovan, 1 C.E.a; Ye et al., 2020a; Y. Zhang & Deng, 2024a). These technologies enable destinations and stakeholders to optimize resource management (e.g., real-time monitoring of visitor flows, smart energy systems in hotels), also to reduce environmental impact (e.g., monitoring and minimizing carbon emissions, managing waste), in addition to enhance the visitor experience (e.g., personalized recommendations, dynamic route planning, interactive and immersive experiences) also, improve governance and planning (e.g., data-driven decision-making, smart marketing, and service co-creation among stakeholders) and for support local communities and heritage preservation through efficient connectivity and resource-sharing frameworks(Gretzel et al., 2015; Sankar & Ilangovan, 1 C.E.a; Ye et al., 2020a; Y. Zhang & Deng, 2024a).

Governments and leading tourism destinations worldwide are actively promoting and investing in such innovations. Policy initiatives, like China's “Guidance to Promote Smart Tourism Development,” emphasize the creation of

information infrastructure, data-sharing platforms, and ecosystem-wide collaboration for smart tourism implementation(Ye et al., 2020a) .

Highlighting the convergence of technological innovation and sustainable development, smart technologies are not only reshaping the ways in which tourism services are delivered and experienced but also reinforcing the foundational goals of sustainability—environmental preservation, economic viability, and social inclusiveness. As global climatic and societal challenges persist, leveraging smart solutions in tourism has become essential for achieving sustainable and resilient growth in the sector.(Gretzel et al., 2015; Sankar & Ilangovan, 1 C.E.a; Ye et al., 2020a; Y. Zhang & Deng, 2024a).

2- Rationale of the Study: The integration of smart technologies—such as IoT, AI, and data analytics—has reshaped global tourism by enhancing experiences and supporting sustainability. However, developing countries like Jordan face barriers including limited infrastructure, policy gaps, and low digital capacity. Despite its rich heritage and tourism potential, there is a lack of comprehensive analysis on how Jordan can effectively leverage smart technologies. This study seeks to bridge that gap by synthesizing global knowledge and contextualizing it within Jordan's tourism landscape, offering guidance for sustainable, technology-driven development.

3- Objectives of the Study

a- To systematically review the role of smart technologies in promoting sustainable tourism.

b- To explore the global trends and best practices of smart tourism.

c- To highlight the current state and potential of smart tourism in Jordan.

d- To identify challenges and opportunities for adopting smart technologies in the tourism sector within Jordan.

*** Problem Statement**

1- Research Questions

a- What are the global trends in using smart technologies to advance sustainable tourism?

b- What are the main technological tools and platforms driving smart tourism?

c- What are the current efforts, opportunities, and barriers in implementing smart tourism in Jordan?

d- How can Jordan align with global best practices in smart sustainable tourism?

2- Scope and Delimitations: Literature published between [2015–2025], addressing the role of smart

technologies in promoting sustainable tourism. It includes peer-reviewed articles, conference proceedings, and policy reports that discuss global practices, theoretical frameworks, and applied models related to smart tourism and sustainability.

The geographic scope Is global in nature, but special attention is given to the context of Jordan as a representative case for developing countries in the Middle East. The review does not conduct fieldwork or primary data collection; instead, it synthesizes secondary sources to draw comparative insights and implications.

Delimitations include the exclusion of literature that deals solely with traditional tourism models, non-digital sustainability practices, or technological applications outside the tourism sector. Also, while the review touches on economic, environmental, and social dimensions of sustainability, it does not deeply engage with niche areas such as blockchain in tourism or virtual reality tourism unless they directly relate to sustainability outcomes.

*** Significance and Uniqueness of the Study**

1- Contribution to Existing Literature: This systematic review contributes to the academic discourse on smart sustainable tourism by consolidating fragmented insights across disciplines and offering novel analytical directions: -

1- Integrative Framework Development: The study offers a multi-dimensional synthesis that unites literature from ICT, sustainability, and tourism domains to construct an integrated conceptual foundation for smart sustainable tourism (Boes et al., 2016; Garanti, 2023). It emphasizes how emerging technologies—including IoT, AI, big data, and mobile applications—act as catalysts for transforming tourism into a more interconnected and responsive system aligned with sustainability objectives (Y. Zhang & Deng, 2024a)

2- Emerging Thematic Dimensions: The review highlights underexplored dimensions such as stakeholder co-creation, data-driven personalization, and real-time system responsiveness in smart tourism strategie)Garanti, 2023(. Additionally, it identifies the progression toward "wise destinations," which prioritize social well-being, community resilience, and long-term adaptability—an area increasingly vital in post-pandemic and climate-sensitive contexts (Andres Coca-Stefaniak, 2024).

3- Methodological Innovation and Synthesis: By applying a systematic and transparent review protocol based on PRISMA guidelines, the study offers a reliable thematic aggregation of diverse sources, including academic journals, government reports, and policy white papers (Y. Zhang & Deng, 2024b). It also charts regional and sectoral variances in adoption levels, offering a comparative perspective on enabling and inhibiting factors in the diffusion of smart solutions (El Archi et al., 2023a; Rodrigues et al., 2023; Y. Zhang & Deng, 2024b)

4- Directions for Future Research: The review Identifies clear research gaps, particularly the limited longitudinal evidence on the social and ecological implications of smart tourism initiatives. It calls for context-sensitive, participatory research involving multi-stakeholder perspectives, especially in underrepresented regions and fragile tourism economies (Y. Zhang & Deng, 2024b).

5- Actionable Policy Insights: Finally, the study distills actionable insights for policy and practice by outlining conditions for effective governance, stakeholder coordination, and adaptive regulatory frameworks essential for scaling smart tourism in line with sustainable development priorities (El Archi et al., 2023a; Y. Zhang & Deng, 2024b). It compiles international best practices and challenges into an accessible reference point for public and private sector actors alike (Rodrigues et al., 2023; Sankar & Ilangovan, 1 C.E.a).

Collectively, these contributions strengthen the theoretical and practical foundations of smart sustainable tourism, while offering a roadmap for future exploration and implementation in both global and region-specific contexts.

2- Focus on Jordan as a Regional Context

a- Jordan's Strategic Position in Smart and Sustainable Tourism: Jordan has emerged as a leading advocate for smart and sustainable tourism in the Middle East by aligning national priorities with technological innovation and environmental stewardship. Tourism is recognized not only as a driver of economic diversification but also as a platform for cultural engagement and global outreach. The country's policy vision merges digital advancement with responsible tourism development to support long-term resilience and competitiveness (Digital Tourism and Innovation, n.d.; National Strategies - Ministry of

Tourism and Antiquities, n.d.; Ministry of Tourism and Antiquities, 2020).

b- Strategic Interventions and Regional Influence

1- Digital Transformation of the Tourism Experience: Jordan's National Tourism Strategy (2021–2025) emphasizes the integration of smart tools—including real-time data platforms, customized itinerary planners, and immersive virtual experiences—to optimize visitor engagement and spatial distribution (Ministry of Tourism and Antiquities, 2020). Flagship initiatives such as the "GO JORDAN" platform, alongside tools like the Petra Coin and Dahab Guide, illustrate the practical deployment of AI, multilingual interfaces, and blockchain-based solutions to modernize tourism operations and stimulate investment (Tareq W. S., 2025; "Tourism 2025" Conference Kicks off in Amman with Focus on Digital Transformation and Investment – Jordan Daily, 2025a).

2- Eco-Tourism and Local Empowerment: The country promotes sustainability through initiatives that combine environmental ethics with community participation. Projects like Feynan Ecolodge, the Jordan Trail, and the Wild Jordan Center exemplify eco-friendly design, resource-efficient operations, and direct benefits for local populations (Jordan Mw Tours | Luxury & Group Tours in Jordan by Locals, n.d.; Shamaseen, 2024). National policies support these efforts by enforcing environmental standards and incentivizing sustainable certifications, thereby enhancing Jordan's profile as a leader In eco-conscious tourism management (JT, 2024).

3- Interactive and Inclusive Technologies: Jordan has introduced virtual and augmented reality applications at key heritage sites such as Petra, offering digitally enriched experiences that improve access, learning, and pre-visit decision-making (Al-Manaseer et al., n.d.). Mobile-based platforms further provide dynamic content, emergency assistance, and on-the-go cultural information, contributing to a seamless and secure visitor journey ("Tourism 2025" Conference Kicks off in Amman with Focus on Digital Transformation and Investment – Jordan Daily, 2025b).

c- Distinctive Features in Regional and Academic Discourse

1- Operationalization of Policy through Technology: Unlike many regional counterparts, Jordan has translated national strategies into measurable programs, demonstrating

how smart technology can support inclusive growth and environmental objectives. These initiatives are characterized by strong public-private cooperation, infrastructure development, and capacity-building efforts aimed at empowering tourism professionals with digital skills (Ministry of Tourism and Antiquities, 2020; Shamaseen, 2024; TOURISM SECTOR Green Growth National Action Plan 2021-2025 Agriculture Energy Waste Water Tourism Transport, 2020a).

2- A Practical Model for Innovation: Jordan serves as a functional testbed for examining how smart tourism addresses multifaceted challenges—from limited natural resources and heritage preservation to changing traveler expectations and public health concerns. Its evolving practices have been referenced in numerous scholarly reviews as indicative of scalable, context-aware solutions adaptable to similar tourism economies (JT, 2024; TOURISM SECTOR Green Growth National Action Plan 2021-2025 Agriculture Energy Waste Water Tourism Transport, 2020a).

Area	Example Initiatives/Technologies	Role in Sustainable Tourism
Digital Platforms	GO JORDAN, National digital maps, AI-powered guides	Visitor experience, resource optimization(Shamaseen, 2024)
Eco-sustainability	Feynan Ecolodge, Jordan Trail, Wild Jordan Center	Conservation, local empowerment
Immersive Tech	Virtual/augmented reality at Petra, interactive museum exhibitions	Engagement, accessibility, preservation(Tareq W. S., 2025)
Policy Innovation	National Tourism Strategy 2021-2025, Green Growth Action Plan, public-private partnerships	Scale and speed of adoption (National Strategies - Ministry of Tourism and Antiquities, n.d.)

Jordan's case offers critical insights into how emerging economies can successfully integrate smart technologies within a sustainability framework. Through forward-looking governance, strategic digitalization, and a commitment to heritage protection, Jordan has positioned itself as a dynamic example of resilient and responsible tourism development. These experiences not only inform national policy but also provide replicable lessons for regional and global stakeholders seeking to implement sustainable tourism strategies in complex and rapidly evolving environments (National Strategies - Ministry of Tourism and Antiquities, n.d.; "Tourism 2025" Conference Kicks off in Amman with Focus on Digital Transformation and Investment – Jordan Daily, 2025b).

*** Conceptual Framework**

This section outlines the core theoretical constructions

underpinning smart and sustainable tourism, providing a multidimensional lens through which the role of digital technologies can be analyzed.

1- Definitions: Smart Tourism, Sustainability, Digital Technologies: Smart Tourism encompasses the strategic application of advanced information and communication technologies (ICTs) to enhance the efficiency, personalization, and sustainability of tourism experiences. It involves the dynamic integration of data from physical infrastructures, human networks, and institutional systems to support responsive destination management and stakeholder collaboration. Smart tourism extends beyond service enhancement to foster innovation, accessibility, and participatory value creation between visitors and host environments, particularly within smart cities and technologically enabled destinations (Cerdá-Mansilla et al., 2024; Li, 2025; J. Liu et al., 2024; Ödemiş, 2022; Otowicz et al., 2022; Ye et al., 2020a)

Sustainability in tourism refers to a development paradigm that aims to safeguard the long-term viability of tourism destinations by balancing environmental conservation, socio-cultural integrity, and economic prosperity. Sustainable tourism emphasizes responsible resource use, equitable benefit-sharing with host communities, and protection of cultural and natural assets to meet present needs without compromising those of future generations (Li, 2025; Otowicz et al., 2022; Ye et al., 2020a).

Digital Technologies within the tourism domain include a suite of tools such as the Internet of Things (IoT), artificial intelligence (AI), big data analytics, mobile applications, cloud services, augmented reality (AR), and virtual reality (VR). These technologies enable seamless data collection, intelligent processing, and real-time service delivery, thereby supporting smart, adaptive, and sustainable tourism systems (Cerdá-Mansilla et al., 2024; Ödemiş, 2022; Ye et al., 2020b; J. Zhang et al., 2020).

2- Dimensions of Sustainable Tourism: Sustainable tourism is a complex, multidimensional concept encompassing the following interrelated dimensions: -

a- Environmental Dimension: Prioritizes the conservation of ecosystems, reduction of pollution, carbon footprint minimization, and promotion of resource-efficient infrastructure.

The framework for sustainable tourism encompasses four

interconnected dimensions. The economic dimension aims to generate inclusive and stable economic benefits, stimulate sustainable entrepreneurship, and enhance the resilience of both local and national tourism economies. The socio-cultural dimension emphasizes the preservation of cultural heritage, the promotion of respect for local traditions, the empowerment of host communities, and the assurance of equitable participation in tourism planning and its associated benefits. The technological dimension highlights the role of digital innovations in facilitating sustainable practices, improving service delivery, and broadening accessibility for diverse tourist segments. Finally, the governance and policy dimension focus on strengthening institutional capacity, establishing effective regulatory frameworks, ensuring strategic coordination, and implementing robust performance monitoring systems to support the development and continuity of sustainable tourism policies (Boes et al., 2016; Li, 2025; Otowicz et al., 2022; Ye et al., 2020b).

3- Application of Smart Technologies in Tourism: Smart technologies play a transformative role in shaping tourism systems by introducing data-driven, adaptive, and inclusive solutions: -

a- Data-Driven Decision Making: Deployment of IoT devices, big data platforms, and AI algorithms enables continuous monitoring of visitor patterns, resource usage, and environmental conditions, allowing for proactive and evidence-based destination management(Cerdá-Mansilla et al., 2024).

b- Personalized Tourist Experiences: AI-enhanced mobile applications and immersive AR/VR interfaces provide tailored experiences, interactive guides, and dynamic itinerary planning, enriching tourist engagement(Ödemiş, 2022).

c- Enhanced Accessibility and Mobility: Innovations in smart transportation, digital ticketing, and geolocation services reduce friction in travel, support universal access, and improve navigational efficiency.(Ye et al., 2020b)

d- Sustainable Resource Management: Integration of smart energy systems, eco-efficient waste management, and environmentally intelligent infrastructure supports the reduction of ecological impacts and promotes sustainable destination design(Shafiee et al., 2021).

e- Stakeholder Collaboration and Co-creation: Digital platforms facilitate multi-stakeholder engagement by

enabling shared data use, service co-creation, and participatory planning between tourists, businesses, government agencies, and communities(Otowicz et al., 2022).

f- Crisis and Risk Management: Smart technologies contribute to safety and resilience through early-warning systems, health surveillance, and digital crisis communication during emergencies and global disruptions.(J. Zhang et al., 2020)

Through these mechanisms, smart technologies support the tourism sector's transition toward more resilient, efficient, and sustainability-aligned models of growth and development.

*** Methodology**

This study adopts a systematic review methodology guided by PRISMA standards to examine how smart technologies contribute to sustainable tourism, with a contextual focus on Jordan. The review process involved formulating research questions, identifying relevant literature, applying inclusion and exclusion criteria, and conducting thematic analysis.

1- Systematic Review Approach: The review synthesized peer-reviewed academic studies and institutional reports published between 2015 and 2025, emphasizing technological applications in sustainable tourism. The aim was to generate an evidence-based overview while highlighting regional insights from Jordan.

2- Inclusion and Exclusion Criteria

A- Included: Peer-reviewed articles, book chapters, and conference proceedings addressing smart technologies in tourism and sustainability, especially within developing and Middle Eastern contexts.

b- Excluded: Non-academic sources, studies lacking a smart technology focus, or unrelated to tourism sustainability.

3- Data Sources and Search Strategy: Data were collected from Scopus, Web of Science, ScienceDirect, SpringerLink, and Google Scholar, supplemented by policy reports from UNWTO, OECD, and WTTC. Searches were limited to English-language publications from 2015–2025.

4- Analysis Framework: A qualitative thematic analysis was used to categorize findings into key domains: governance, infrastructure, tourist behavior, sustainability outcomes, and barriers. Jordan-specific insights were extracted as a distinct theme. Manual coding and spreadsheet tools supported the synthesis of patterns and knowledge gaps to inform policy and practice.

*** Findings and Thematic Analysis**

1- Smart Technologies and Sustainable Tourism Worldwide: Globally, smart technologies are increasingly acknowledged as essential catalysts for promoting sustainable tourism by enhancing operational efficiency, enriching visitor experiences, and improving resource management (Tourism Industry Trends for 2025 - AI, Sustainability, and Emerging Travel Norms, 2024). Innovations such as IoT-enabled smart kiosks, real-time crowd monitoring, smart energy systems, and integrated mobility platforms are revolutionizing how destinations function, making them more sustainable and appealing to travelers (2025 EU Smart Tourism: Turin and Benidorm's Success in Data - Data Appeal, n.d.). Notable examples include Miami-Dade, which has leveraged real-time data to enhance traffic flow and safety (LEADING EXAMPLES OF SMART TOURISM PRACTICES IN EUROPE from the 2025 European Capital of Smart Tourism Competition, n.d.), and European cities like Turin, which integrate AI, smart mobility, and inclusive tourism strategies to work toward carbon neutrality and cultural preservation (Sankar & Ilangovan, 1 C.E.b). The projected growth of the global smart cities market—with a compound annual growth rate (CAGR) of 16% through 2031—reflects strong investment in technology-driven solutions that support both urban development and sustainable tourism (Hoang & Trang, 2023a). These technologies contribute to optimized energy consumption, waste reduction, improved distribution of tourist flows, efficient event management, and personalized travel experiences, thereby aligning technological innovation with the broader goals of sustainable tourism development (Myrovali et al., 2025).

2- Key Thematic Areas (e.g., Smart Governance, Smart Destinations, Smart Tourists, Smart Mobility)

A- Smart Governance: Smart governance utilizes advanced digital tools—including AI, big data, and IoT—to support transparent, evidence-based policymaking and inclusive stakeholder collaboration. These technologies facilitate efficient resource allocation, cultural heritage protection, and rapid crisis response, while fostering integrated partnerships among governments, local communities, and tourism actors (Hoang & Trang, 2023b; Sankar & Ilangovan, 1 C.E.c; Y. Zhang & Deng, 2024c)

b- Smart Destinations: The concept of smart destinations encompasses

the deployment of digital infrastructure and platforms to improve service quality, environmental sustainability, and destination appeal. Examples include the integration of real-time information systems, sustainable energy networks, and AR/VR experiences that enable both cultural innovation and ecological responsibility (2025 EU Smart Tourism: Turin and Benidorm's Success in Data - Data Appeal, n.d.; LEADING EXAMPLES OF SMART TOURISM PRACTICES IN EUROPE from the 2025 European Capital of Smart Tourism Competition, n.d.; Gretzel et al., 2023; Y. Zhang & Deng, 2024c)

c- Smart Tourists: Technology empowers tourists to make informed, responsible, and personalized travel choices. Through AI-driven mobile apps and real-time recommendation engines, travelers can access eco-friendly itineraries, immersive cultural content, and multilingual navigation tools. This enhances user experience while reinforcing sustainable behavior and greater cultural awareness (Gretzel et al., 2023; Sankar & Ilangovan, 1 C.E.c; Y. Zhang & Deng, 2024c).

d- Smart Mobility: Smart mobility integrates transportation networks using real-time data, enabling seamless connectivity and reducing carbon footprints. These systems enhance inclusivity by supporting barrier-free access and improving travel efficiency, thus contributing to low-impact tourism solutions and more equitable visitor access (Gretzel et al., 2023; Tourism Industry Trends for 2025 - AI, Sustainability, and Emerging Travel Norms, 2024).

3- Opportunities and Challenges: Smart technologies significantly contribute to advancing sustainable tourism by enabling enhanced resource efficiency and reducing environmental footprints through real-time, data-driven management systems. These technologies also improve visitor experiences by offering personalized services and immersive tools that foster deeper engagement with cultural heritage and local communities. Furthermore, digital platforms facilitate stronger collaboration among stakeholders, promoting co-creation and participatory approaches to sustainable tourism planning. In addition, the integration of smart solutions accelerates policy innovation and implementation, helping destinations align more effectively with sustainable development goals. Notably, the expansion of sustainable ecotourism has been supported by the application

of technologies such as IoT, AI, and data analytics, particularly in managing and preserving natural and cultural heritage sites(Hoang & Trang, 2023b; Sankar & Ilangovan, 1 C.E.c; Tourism Industry Trends for 2025 - AI, Sustainability, and Emerging Travel Norms, 2024; Y. Zhang & Deng, 2024c).

*** Challenges**

1- Digital Inequality: Gaps In infrastructure and digital literacy hinder equitable access to smart tourism tools, particularly in developing contexts.

2- Ethical and Privacy Concerns: The extensive collection and use of personal data raise issues of surveillance, consent, and security.

3- Financial Barriers: High capital and operational costs can deter smaller destinations from adopting smart solutions.

4- Technical Fragmentation: Interoperability issues and lack of unified standards complicate system integration and scalability.

5- Capacity Limitations: Effective implementation requires ongoing investment in human capital, governance mechanisms, and context-sensitive adaptation to local values and socio-cultural dynamics (Hoang & Trang, 2023b; Li, 2025; Sankar & Ilangovan, 1 C.E.c; Y. Zhang & Deng, 2024c).

In conclusion, smart technologies hold immense promises for transforming tourism into a more sustainable, inclusive, and resilient sector. However, realizing their full potential necessitates overcoming infrastructural, ethical, and governance-related challenges through integrated, inclusive, and place-based strategies.

*** Focus on Jordan: Contextual Insights**

1- National Strategy for Tourism: Jordan's National Tourism Strategy (2021–2025) outlines a comprehensive vision that frames tourism as a strategic sector for economic growth and socio-cultural development. The strategy aims to restore and exceed pre-pandemic performance levels by targeting a substantial increase in both tourist arrivals and revenue generation by 2025. It is structured around five interconnected pillars: enhancing tourism products, strengthening human capital, modernizing marketing approaches, safeguarding heritage, and implementing institutional and legislative reforms. Developed through extensive collaboration between public institutions and private stakeholders, the strategy promotes equitable regional tourism development and aims to align with the United Nations

Sustainable Development Goals (SDGs). Key governmental bodies—including the Ministry of Tourism and Antiquities (MoTA), the Jordan Tourism Board, and municipal authorities—play an integrated role in coordinating strategy execution (Ghaith, 2021; Ministry of Tourism and Antiquities, 2020; National Tourism Strategy of 2021-2025 Launched, n.d.).

2- Smart Tourism Initiatives in Jordan

*** National-Level Transformation**

1- Unified Digital Tourism Platform: Jordan has prioritized the creation of a comprehensive national tourism app and digital map. This platform is designed to allow visitors to plan, reserve, and manage their itineraries seamlessly — covering entry to major sites like Petra, eco-lodges in Dana, and various events and tours. The platform would also integrate with national payment systems, use real-time data for crowd management, and provide personalized recommendations, safety alerts, and cultural insights(Ghaith, 2021; Tareq W. S., 2025).

2- "Digital Tourist" Initiative: Part of Jordan's Economic Modernisation Vision (EMV), this initiative aims to leverage digital technology for marketing, personalized trip planning, and traveler support. It involves data modernization for better decision-making, expanded connectivity to international tourist sources, and strategic marketing through digital channels (EMV's Tourism Initiatives Enhance Jordan's Status as Global Destination | Jordan Times, 2025; Strategic Tourism Initiatives to Elevate Jordan's Global Stand..., n.d.; Tourism Initiatives to Boost Jordan Global Destination Status | Travel | Jordan Pulse, n.d.).

*** Site-Specific Smart Solutions**

1- Smart Heritage Sites: At locations such as Petra, Jerash, and the Baptism Site, smart lighting, digital signage, occupancy sensors, and waste management IoT solutions are being implemented. These technologies enhance visitor experience, guide crowd movement, and improve site preservation(Tareq W. S., 2025).

2- AR/VR for Heritage and Accessibility: Jordan is deploying augmented and virtual reality to make historical sites more interactive. Virtual reconstructions, immersive exhibitions, and AR-guided tours are being introduced at venues including Petra, the Jordan Museum, and Dead Sea resorts, enhancing both accessibility and educational value for visitors with varying needs(Tareq W. S., 2025).

3- Smart City Projects – Amman: As part of Amman's Smart City Project, the city is establishing infrastructure for smart transportation, multimodal mobility, and urban data-driven management — all of which benefit both residents and visitors. This includes real-time navigation, digitalized parking, and sensor-based monitoring for safety and efficiency(GAM Announces Invitation for "Amman Smart City Project" Tender | Jordan Times, 2024; Ritchey et al., n.d.).

*** Workforce and Capacity Building**

1- Tourism Workforce Upskilling: Through online learning platforms, in-person training, and partnerships with local universities, Jordan is equipping tourism professionals with digital skills — from online bookings to using immersive tech for storytelling(Tareq W. S., 2025).

*** Sustainable and Inclusive Approaches**

1- Eco-Friendly Energy Initiatives: Programs to rationalize energy consumption at hotels and other facilities are part of the smart, sustainable push in the sector(100 Jordan and PDTRA: A Partnership for Progress in Jordan's Tourism Sector – Jordan Daily, n.d.).

*** Public-Private Partnerships and Community Engagement**

1- Modernization of Petra and Community Participation: Projects like the partnership between 100 Jordan and the Petra Development and Tourism Regional Authority focus on modernizing tourist services while involving local businesses and communities in high-quality, energy-efficient infrastructure upgrades at Petra and other heritage sites.

Jordan's initiatives demonstrate a commitment to blending advanced technology with authentic, accessible, and sustainable tourism experiences, positioning the country as a forward-thinking global destination.

3- Barriers to Implementation

a- Focus: Jordan (with Contextual Insights and Global Trends)

*** Key Barriers in Jordan**

1- Policy and Institutional Gaps: Jordan's tourism sector faces fragmented legal and regulatory frameworks, limiting coordination and effective governance for implementing smart technologies. There is a need for updated policies and a unified approach that aligns smart technology adoption with national sustainability goals(Harb et al., 2025; TOURISM SECTOR Green Growth National Action Plan

2021-2025 Agriculture Energy Waste Water Tourism Transport, 2020b).

2- Resource Constraints: Scarcity of financial resources and reliance on external funding hinder large-scale investment in digital infrastructure and smart solutions. This affects the ability to garner and maintain state-of-the-art technologies for sustainable tourism management(TOURISM SECTOR Green Growth National Action Plan 2021-2025 Agriculture Energy Waste Water Tourism Transport, 2020b).

3- Skills and Capacity Gaps: There is a notable shortage of skilled personnel with expertise in digital transformation, data analytics, and smart tourism platforms. Capacity-building programs are essential but currently insufficient(Tareq W. S., 2025; TOURISM SECTOR Green Growth National Action Plan 2021-2025 Agriculture Energy Waste Water Tourism Transport, 2020b).

4- Limited Stakeholder Engagement: Effective integration of smart solutions demands collaboration among government, private sector, and local communities. In Jordan, limited stakeholder involvement leads to disjointed initiatives and a lack of shared vision for smart sustainable tourism(Harb et al., 2025).

5- Infrastructure Challenges: Existing technological infrastructure, particularly outside urban centers, is often inadequate. Connectivity and access to reliable digital services remain uneven, especially in rural and ecotourism locations critical for green tourism (Tareq W. S., 2025; TOURISM SECTOR Green Growth National Action Plan 2021-2025 Agriculture Energy Waste Water Tourism Transport, 2020b).

6- Cultural and Social Barriers: Resistance to digital change among traditional tourism operators and concerns about technology overshadowing authentic cultural experiences add to the complexity of implementation(Tareq W. S., 2025).

*** Contextual Insights: Jordan's Approach**

1- Jordan's Green Growth National Action Plan (2021-2025) calls for targeted reforms, increased investment, and robust institutional frameworks to enable smart and sustainable tourism. However, successful execution is hampered by institutional inertia, investment gaps, and the need for enhanced public-private coordination(TOURISM SECTOR Green Growth National Action Plan 2021-2025 Agriculture Energy Waste Water Tourism Transport, 2020b).

2- The country recognizes the economic benefits of smart tourism (such as increased revenue and rural employment), but full realization is dependent on addressing these multidimensional barriers(Harb et al., 2025; Tareq W. S., 2025).

*** Global Trends and Barriers**

1- Governance and Legal Issues: Globally, ambiguity in data governance, privacy, and cybersecurity regulations slows the adoption of smart tourism technologies. Clear standards and cross-border cooperation are needed(Mutambik, 2024; Song & Wondirad, 2023).

2- Technological Barriers: High upfront costs, rapid obsolescence, and interoperability issues between different platforms impede sustainable implementation, especially for developing nations(Song & Wondirad, 2023; Y. Zhang & Deng, 2024c).

3- Digital Divide: Disparities in access to digital technology—between regions, social groups, and age demographics—limit the inclusiveness and scalability of smart solutions(Song & Wondirad, 2023; Tourism Industry Trends for 2025 - AI, Sustainability, and Emerging Travel Norms, n.d.).

4- Environmental and Cultural Concerns: The need to balance digital advancement with preservation is a global issue, requiring that technology amplify, not detract from, heritage and local identity(Song & Wondirad, 2023; Y. Zhang & Deng, 2024c).

5- Skills Shortages: Across regions, a lack of trained professionals who can develop, operate, and maintain smart tourism systems remains a pressing constraint(Tourism Industry Trends for 2025 - AI, Sustainability, and Emerging Travel Norms, n.d.).

Successfully overcoming these barriers—through policy reform, investment, capacity building, and inclusive stakeholder engagement—will determine whether smart technologies can fulfill their promise of enabling sustainable tourism, both in Jordan and globally. The challenges are complex but surmountable with coordinated action and innovation(Harb et al., 2025; Tareq W. S., 2025; TOURISM SECTOR Green Growth National Action Plan 2021-2025 Agriculture Energy Waste Water Tourism Transport, 2020b).

4- Comparative Insights with Global Trends

Table.2: Comparative Insights with Global Trends

Aspect	Jordan	Global Trends
Strategic Vision	National Strategy focused on sustainable growth with smart tech integration	Widespread emphasis on smart sustainable tourism combining AI, IoT, big data
Technology Adoption	Emerging AI platforms, digital marketing, smart mobility projects	Advanced use of IoT sensors, AR/VR, and integrated data analytics in smart cities
Sustainability Focus	Strong cultural heritage protection and eco-tourism initiatives	Broader environmental, social, and economic sustainability dimensions addressed
Stakeholder Engagement	Inclusive public-private collaboration, local community involvement	Multi-level governance with extensive stakeholder networks emphasized
Challenges	Funding, digital infrastructure gaps, capacity limitations	Data privacy, interoperability, high costs, digital divide worldwide
Innovation Pace	Growing but constrained by regional factors and resource limits	Faster adoption in developed smart tourism hubs globally

Jordan's experience offers a valuable reference point for similarly situated emerging economies, highlighting the potential of tailored smart tourism models that balance digital advancement with socio-environmental sensitivity(Ghaith, 2021; Jordan Unveils Vision 2025 to Boost Tourism, n.d.; TOURISM SECTOR Green Growth National Action Plan 2021-2025 Agriculture Energy Waste Water Tourism Transport, 2020b).

* Discussion

1- Interpretation of Results: The systematic review underscores the critical role of smart technologies in promoting sustainability within the tourism sector. Tools such as the Internet of Things (IoT), artificial intelligence (AI), big data analytics, and immersive technologies like augmented and virtual reality (AR/VR) have demonstrated their capacity to enhance operational efficiency, environmental monitoring, and visitor personalization. These technologies enable dynamic and data-informed management of tourism resources, particularly in ecologically and culturally sensitive areas, thereby supporting a balance between growth and conservation imperatives(El Archi et al., 2023b; Tourism Industry Trends for 2025 - AI, Sustainability, and Emerging Travel Norms, n.d.).

One notable finding Is the effectiveness of smart ecotourism models that utilize real-time monitoring, customized services, and participatory governance mechanisms to align with sustainability goals. However, the diffusion of these innovations remains geographically uneven, with many developing regions facing infrastructural, institutional, and

human resource constraints that limit adoption and scalability.

2- Policy and Practical Implications: The findings of this review yield important implications for both policy formulation and practical implementation: -

1- Fostering multi-stakeholder collaboration is essential. Effective integration of smart technologies requires partnerships that span government agencies, private enterprises, local communities, and academic institutions to co-create inclusive and sustainable solutions.

2- Targeted investment In digital infrastructure and skill development—especially in underserved or rural areas—is necessary to reduce disparities in access and promote equitable participation in smart tourism ecosystems.

3- Establishing robust regulatory frameworks that govern data protection, cybersecurity, and the ethical use of AI will enhance trust among users and tourism service providers.

4- Encouraging innovation through supportive financial instruments, such as green technology grants, smart infrastructure subsidies, and startup incentives, can accelerate adoption.

5- Implementing continuous monitoring and evaluation mechanisms using big data and predictive analytics can enable real-time adjustments, strengthen accountability, and refine strategic planning.

For practitioners, the adoption of smart technologies presents opportunities to enhance operational effectiveness, reduce environmental impact, deliver personalized services, and support heritage protection. Furthermore, the use of AR/VR and AI in educational content offers innovative pathways to foster responsible tourist behavior and cultural sensitivity.

3- Research Gaps: While the integration of smart technologies into tourism is progressing, several critical research gaps remain: -

1- There is a scarcity of longitudinal empirical studies that evaluate the sustained social, economic, and ecological outcomes of smart technology interventions across diverse tourism settings.

2- Inclusivity in smart tourism—particularly in relation to marginalized communities and digitally excluded populations—remains underexplored in both practice and literature.

3- The interoperability of technological systems across

different tourism stakeholders and platforms presents challenges that require further investigation, particularly regarding standardization and data integration.

4- Ethical dimensions of data ownership, algorithmic transparency, and AI governance in tourism-specific applications demand deeper academic inquiry.

5- The current literature lacks cross-regional comparative analyses, especially within developing and emerging economies, which are essential for contextualizing best practices and identifying scalable models.

•Future research should address adaptive governance frameworks that align the pace of technological advancement with socio-cultural and environmental sustainability priorities.

Addressing these gaps is essential for building a more comprehensive theoretical foundation and developing actionable insights to guide policy, innovation, and practice in the evolution of smart, sustainable tourism worldwide.

*** Conclusion and Recommendations**

1- Summary of Key Findings: This systematic review reveals that the application of smart technologies, particularly the Internet of Things (IoT), artificial intelligence (AI), and big data analytics—plays a transformative role in advancing the sustainability of the global tourism sector. These technologies facilitate real-time environmental monitoring, optimize resource consumption, and enable tailored visitor experiences, thereby enhancing operational efficiency and ecological stewardship. Additionally, immersive tools such as augmented and virtual reality (AR/VR) contribute to conservation education and foster more responsible tourist behaviors. (Rodrigues et al., 2023; Y. Zhang & Deng, 2024c).

The review Identifies effective collaboration among governments, local communities, and private sector actors as a key enabler for successful implementation of smart tourism strategies. Nonetheless, disparities in digital infrastructure and technical capacity continue to limit progress, especially in developing regions. Jordan presents a noteworthy example of national commitment to smart sustainable tourism, reflected in its strategic planning and eco-innovation projects. However, persistent challenges such as uneven digital access and financial limitations remain (Rodrigues et al., 2023; Y. Zhang & Deng, 2024c).

2- Policy Recommendations: To harness the potential of smart technologies in sustainable tourism, key policy actions include: -

1- Expanding digital infrastructure in underserved and heritage-rich areas.

2- Promoting cross-sector collaboration among public, private, and academic stakeholders.

3- Establishing clear legal and ethical frameworks for data governance and AI use.

4- Investing in capacity-building programs to enhance digital literacy in the tourism workforce.

5- Offering financial incentives to encourage innovation and technology adoption, especially for SMEs.

6- Institutionalizing monitoring systems using data analytics for adaptive policymaking.

3- Future Research Directions: Future research should focus on: -

1- Evaluating long-term socio-economic and environmental impacts of smart technologies.

2- Designing inclusive models that address digital access inequalities.

3- Investigating interoperability challenges across tourism systems.

4- Exploring ethical implications of AI and data use in tourism contexts.

5- Conducting comparative studies across regions, particularly in emerging economies.

6- Developing adaptive governance models that integrate technology with sustainability and cultural values.

Such research will strengthen both theoretical understanding and practical application of smart tourism in diverse global contexts.

(Majid et al., 2023; Rodrigues et al., 2023; Y. Zhang & Deng, 2024c).

*** References**

100 Jordan and PDTRA: A partnership for progress in Jordan's tourism sector – Jordan Daily. (n.d.). Retrieved July 26, 2025, from https://jordandaily.net/100-jordan-and-pdtra-a-partnership-for-progress-in-jordans-tourism-sector/

2025 EU Smart Tourism: Turin and Benidorm's success in data - Data Appeal. (n.d.). Retrieved July 25, 2025, from https://datappeal.io/2025-eu-smart-tourism-turin-and-benidorm/

Al-Manaseer, J., Abdelghani, K., Idlebi, N., & Funna, R. (n.d.). STUDY ON THE HASHIMITE KINGDOM OF JORDAN'S READINESS AND POTENTIAL TO UTILIZE IMMERSIVE TECHNOLOGIES .

Andres Coca-Stefaniak, J. (2024). Beyond smart tourism cities-towards a new generation of "wise" tourism destinations.

Boes, K., Buhalis, D., & Inversini, A. (2016). Smart tourism destinations: ecosystems for tourism destination competitiveness. International Journal of Tourism Cities, 2(2), 108–124. https://doi.org/10.1108/ijtc-12-2015-0032

Cerdá-Mansilla, E., Tussyadiah, I., Campo, S., & Rubio, N. (2024). Smart destinations: A holistic view from researchers and managers to tourists and locals. Tourism Management Perspectives, 51, 101223. https://doi.org/10.1016/J.TMP.2024.101223

Digital Tourism and Innovation. (n.d.). Retrieved July 24, 2025, from https://asfanco.com/blogs/digital-tourism

El Archi, Y., Benbba, B., Nizamatdinova, Z., Issakov, Y., Vargáné, G. I., & Dávid, L. D. (2023a). Systematic Literature Review Analysing Smart Tourism Destinations in Context of Sustainable Development: Current Applications and Future Directions. Sustainability 2023, Vol. 15, Page 5086, 15(6), 5086. https://doi.org/10.3390/SU15065086

EMV's tourism initiatives enhance Jordan's status as global destination | Jordan Times. (2025). https://jordantimes.com/news/business/emvs-tourism-initiatives-enhance-jordans-status-global-destination

GAM announces invitation for "Amman Smart City Project" Tender | Jordan Times. (2024). https://jordantimes.com/news/local/gam-announces-invitation-%E2%80%9Camman-smart-city-project%E2%80%9D-tender

Garanti, Z. (2023). Value co-creation in smart tourism destinations. Worldwide Hospitality and Tourism Themes, 15(5), 468–475. https://doi.org/10.1108/WHATT-06-2023-0070

Ghaith, B. (2021). 'Ambitious, but realistic' National Tourism Strategy 2021-2025 launched | Jordan Times. https://jordantimes.com/news/local/%E2%80%98ambitious-realistic%E2%80%99-

national-tourism-strategy-2021-2025-launched

Gretzel, U., Lee, H., Lee, E., Chung, N., & Koo, C. (2023). Enhanced Smart Tourism and its Role in Reshaping the Tourism Industry. Journal of Smart Tourism, 3(4), 23–31. https://doi.org/10.52255/SMARTTOURISM.2023.3.4.4

Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2015). Smart tourism: foundations and developments. Electronic Markets, 25(3), 179–188. https://doi.org/10.1007/s12525-015-0196-8

Harb, A., Alhammad, F. A., Almajali, T. A., Freewan, A., Shkokani, H. M. K., & Slehat, M. (2025). Promoting Tourism Sustainability in Jordan: Policy Effectiveness and Stakeholders Perspectives. Contemporary Review of the Middle East, 12(2), 175–196. https://doi.org/10.1177/23477989251319625;JOURNAL:JOURNAL:CMEA;WGROUP:STRING:PUBLICATION

Hoang, H., & Trang, P. H. (2023). Navigating the Rise of Smart Tourism: Implications of Technology and Data for Sustainable Industry Growth. Brawijaya Journal of Social Science, 3(1), 1–18. https://doi.org/10.21776/UB.BJSS.2023.003.01.1

Jordan Mw Tours | Luxury & Group Tours in Jordan by Locals. (n.d.). Retrieved July 24, 2025, from https://jordanmw.com/jordan-sustainable-tourism/

Jordan Unveils Vision 2025 to Boost Tourism. (n.d.). Retrieved July 25, 2025, from https://www.hdfcergo.com/news/travel-insurance/jordan-unveils-vision-2025-to-boost-tourism

JT. (2024). "Jordan's tourism sector takes major step towards sustainability" | Jordan Times. https://jordantimes.com/news/local/jordans-tourism-sector-takes-major-step-towards-sustainability

LEADING EXAMPLES OF SMART TOURISM PRACTICES IN EUROPE from the 2025 European Capital of Smart Tourism competition. (n.d.).

Li, P. (2025). Current status and sustainable development of international smart tourism research: a literature review. Current Issues in Tourism. https://doi.org/10.1080/13683

500.2025.2504647;WGROUP:STRING:PUBLICATION

Liu, D., Ji, J., & Wu, M. (2023). How Smart Technologies Are Revolutionizing Sustainable Travel. Https://Forestnation.Com/. https://doi.org/10.1080/1528008X.2023.2266861

Liu, J., Hall, C. M., Zhu, C., & Ting Pong Cheng, V. (2024). Redefining the concept of smart tourism in tourism and hospitality. Anatolia, 35(3), 566–578. https://doi.org/10.1080/13032917.2023.2282712

Majid, G. M., Tussyadiah, I., Kim, Y. R., & Pal, A. (2023). Intelligent automation for sustainable tourism: a systematic review. Journal of Sustainable Tourism, 31(11), 2421–2440. https://doi.org/10.1080/09669582.2023.2246681;WGROUP:STRING:PUBLICATION

Ministry of Tourism and Antiquities. (2020). A Tourism Strategy That Is Fit for Purpose and Circumstance.

Mutambik, I. (2024). Unlocking the Potential of Sustainable Smart Cities: Barriers and Strategies. Sustainability 2024, Vol. 16, Page 5061, 16(12), 5061. https://doi.org/10.3390/SU16125061

Myrovali, G., Tzanis, G., & Morfoulaki, M. (2025). Sustainable Tourism Through Digitalization and Smart Solutions. Sustainability 2025, Vol. 17, Page 5383, 17(12), 5383. https://doi.org/10.3390/SU17125383

National Strategies - ministry of tourism and antiquities. (n.d.). Retrieved July 24, 2025, from https://mota.gov.jo/En/List/National_Strategies

National Tourism Strategy of 2021-2025 launched. (n.d.). Retrieved July 25, 2025, from https://www.petra.gov.jo/Include/InnerPage.jsp?ID=39906&lang=en&name=en_news

Ödemiş, M. (2022). Smart Tourism Destinations. 131–153. https://doi.org/10.4018/978-1-7998-8306-7.CH007

Otowicz, M. H., Macedo, M., & Biz, A. A. (2022). Dimensions of Smart Tourism and Its Levels: An Integrative Literature Review. Journal of Smart Tourism, 2(1), 5–19. https://doi.org/10.52255/SMARTTOURISM.2022.2.1.2

Ritchey, B., Hochmuth, J., & Ochoa, Y. (n.d.). Meeting Urban

Challenges in Amman with a Smart City Plan - CDM Smith. Retrieved July 26, 2025, from https://www.cdmsmith.com/en/client-solutions/projects/smart-amman

Rodrigues, V., Eusébio, C., & Breda, Z. (2023). Enhancing sustainable development through tourism digitalisation: a systematic literature review. Information Technology and Tourism, 25(1), 13–45. https://doi.org/10.1007/S40558-022-00241-W

Sankar, J. G., & Ilangovan, K. (1 C.E.a). The Role of Smart Technology in Enhancing Sustainable Tourism Experiences. Https://Services.Igi-Global.Com/Resolvedoi/Resolve.Aspx?Doi=10.4018/979-8-3693-7388-0.Ch014, 379–408. https://doi.org/10.4018/979-8-3693-7388-0.CH014

Shafiee, S., Rajabzadeh Ghatari, A., Hasanzadeh, A., & Jahanyan, S. (2021). Smart tourism destinations: a systematic review. Tourism Review, 76(3), 505–528. https://doi.org/10.1108/TR-06-2019-0235

Shamaseen. (2024). Case Studies and Success Stories: Examples of Successful Responsible Tourism Projects in Jordan | Jordan Horizons Tours & Travel is tour operator specializing in private and custom tours in Jordan. https://johtt.com/en/kb/responsible-tourism-initiatives-in-jordan/

Song, Q., & Wondirad, A. (2023). Demystifying the nexus between social media usage and overtourism: evidence from Hangzhou, China. Asia Pacific Journal of Tourism Research, 28(4), 364–385. https://doi.org/10.1080/10941665.2023.2230313

Strategic Tourism Initiatives to Elevate Jordan's Global Stand... (n.d.). Retrieved July 26, 2025, from https://www.jordannews.jo/Section-114/All/Strategic-Tourism-Initiatives-to-Elevate-Jordan-s-Global-Standing-as-a-Destination-41902

Tareq W. S. (2025). Smart Tourism in Jordan: Crafting Unforgettable Journeys Through Innovation. https://www.linkedin.com/pulse/smart-tourism-jordan-

crafting-unforgettable-journeys-through-shahwan-vjxge

"Tourism 2025" conference kicks off in Amman with focus on digital transformation and investment – Jordan Daily. (2025). https://jordandaily.net/tourism-2025-conference-kicks-off-in-amman-with-focus-on-digital-transformation-and-investment/

Tourism industry trends for 2025 - AI, sustainability, and emerging travel norms. (2024). https://blog.smart-guide.org/en/tourism-industry-trends-2025-ai-sustainability-emerging-travel-norms

Tourism Initiatives to Boost Jordan Global Destination Status | Travel | jordan pulse. (n.d.). Retrieved July 26, 2025, from https://www.jordanpulse.com/article/7942

TOURISM SECTOR Green Growth National Action Plan 2021-2025 Agriculture Energy Waste Water Tourism Transport. (2020).

Ye, B. H., Ye, H., & Law, R. (2020). Systematic review of smart tourism research. Sustainability (Switzerland), 12(8). https://doi.org/10.3390/SU12083401

Zhang, J., Li, Y., & Cheng, R. (2020). Review of research on smart tourism at home and abroad. 1. https://doi.org/10.54517/st.v1i2.1696

Zhang, Y., & Deng, B. (2024). Exploring the nexus of smart technologies and sustainable ecotourism: A systematic review. Heliyon, 10(11), e31996. https://doi.org/10.1016/J.HELIYON.2024.E31996