Chapter 4
Artificial Intelligence–Based Sustainable Tourism Planning:
A Conceptual Model Proposal

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ABSTRACT

This book chapter introduces a groundbreaking conceptual model aimed at revolutionizing sustainable tourism planning through the incorporation of artificial intelligence (AI). As society grapples with pressing environmental challenges, the pivotal role of technology becomes increasingly evident. In response, this model seamlessly integrates AI to offer a sophisticated framework that optimizes resource allocation, mitigates ecological impact, and elevates overall visitor experiences within the realm of sustainable tourism. The core objective of this innovative model is to leverage AI's capabilities in the analysis of extensive datasets, enabling data-driven decision-making processes crucial for the formulation of efficient strategies in destination management. By harnessing the immense computing power of AI, the model strives to facilitate proactive and informed decision-making, ensuring a more sustainable approach to tourism planning.

INTRODUCTION

Artificial intelligence (AI) has led to significant transformations in various sectors (Wamba-Taguimdje et al., 2020). The transformation driven by AI plays a crucial role in sustainable tourism (Nabila, 2023a). AI provides substantial added value by offering innovative solutions to the tourism sector. AI technology stands out in the tourism sector by providing solutions that are compatible with sustainability (Rane et al., 2023). AI can help tourism firms reduce their environmental and social impacts by focusing on factors such as energy efficiency, waste management, and natural resource utilization (Nizetic et al., 2019). AI-based analyses and predictions can assist tourism firms in managing their resources more efficiently and achieving sustainability goals. The presence of AI in the tourism sector can be seen as a significant

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tool for optimizing operations, increasing environmental and social responsibilities, and consequently enhancing sustainable tourism (Van et al., 2020).

One of the significant criteria for sustainable tourism is resource efficiency (Bricker and Schultz, 2011). AI has the potential to enhance the efficiency and management of resources. The analysis of large datasets by AI enables tourism firms to use their resources more effectively (Ivanov and Webster, 2017). AI algorithms can assist tourism firms in optimizing energy consumption, waste management, and water usage (Kamyab et al., 2023). The extensive data analyzed by AI supports firms in improving their daily operations in the tourism sector. Big data analyses can help firms control energy consumption, reduce waste, and minimize water usage (Corbett, 2018). As a result, firms cannot manage their costs and achieve their goals of minimizing environmental impact. Therefore, in the tourism sector, AI increases operational efficiency and supports tourism firms in reaching their environmental sustainability objectives (Ivanov and Webster, 2019).

AI provides tourists with opportunities for real-time information on smart solutions, eco-friendly attractions, nature reserves, and sustainability practices (Rane et al., 2023). Through supportive tools developed for tourists, AI offers advantages in increasing environmental awareness and providing information about sustainability at the destinations they visit (Ali and Frew, 2013). AI-based chatbots and virtual assistants can guide tourists to make environmentally conscious choices by providing personalized guidance. As a result, tourists gather information about destinations while exploring, and actively take part in sustainable tourism practices (Khan et al., 2024). With AI assistance, tourists can shop from firms that reduce environmental impact, support nature conservation projects, and choose eco-friendly activities (Sinha et al., 2021). The tourist experience supported by AI aids in conscious travel and encourages meaningful interaction between destinations and tourists. Therefore, the AI-based tourist experience has the potential to promote sustainability in the tourism sector (Majid et al., 2023).

AI-based smart transportation systems offer several advantages for sustainable travel. These systems aim to create a sustainable transportation ecosystem by optimizing routes, reducing traffic congestion, and increasing fuel efficiency (Iyer, 2021). AI algorithms can analyze traffic to plan the best route, allowing AI-based transportation systems to regulate traffic flow and suggest alternative routes for drivers, resulting in time and energy savings (Abduljabbar et al., 2019). Using AI can facilitate the effective utilization of public transportation and environmentally friendly transportation systems (Ivanova, 2022). The benefits of AI-based transportation systems in sustainable travel involve reducing carbon footprints and encouraging the preference for public transportation and eco-friendly transportation systems, promoting sustainable transportation (Saleh et al., 2024). AI supports the creation of an environmentally friendly transportation infrastructure and contributes to the development of sustainable travel in destinations (Rane et al., 2023).

AI can be utilized for the conservation of biodiversity and nature in areas heavily impacted by tourism (Balsalobre-Lorente et al., 2023). AI, particularly through machine learning algorithms, satellite imaging, and sensor networks, serves as a significant tool for monitoring endangered plant and animal species and implementing conservation measures. The status of natural ecosystems in tourist destinations can be monitored in detail and in real time with the use of AI (Raihan, 2023a). Machine learning algorithms for AI can analyze data from various sources, such as satellite imaging and sensor networks, to evaluate the biodiversity status of destinations and track the condition of endangered species instantly (Shivaprakash et al., 2022). The information provided by AI can guide conservation experts and local authorities in taking protective measures. Therefore, the role of AI in conservation efforts can enable a more effective and anticipatory approach to preserving natural ecosystems in tourist destinations (Palomares et al., 2021).